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A SURVEY OF PARKING LOT UTILIZATION AT THE SOUTH CAMPUS, MACOMB COUNTY COMMUNITY COLLEGE.

MACOMB COUNTY COMMUNITY COLL., WARREN, MICH.

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COLLEGE PARKING FACILITIES SHOULD (1) PERMIT FREE MOVEMENT OF VEHICLES, (2) ACCOMMODATE PEAK HOUR TRAFFIC DEMANDS, INCLUDING PROVISION OF RESERVOIR SPACE AT ENTRANCES AND EXITS, (3) BE ADEQUATELY MARKED AND POSTED, (4) BE DESIGNED TO ALLOW INTERNAL MOVEMENT, EASE AND SAFETY OF ACCESS, ADEQUATE MANEUVERING AREAS, AND GENERAL CONVENIENCE, AND (5) BE ADEQUATE FOR FACULTY AND STAFF, VISITOR, AND STUDENT NEEDS. A COMMITTEE AT MACOMB COUNTY COMMUNITY COLLEGE STUDIED THE PARKING FACILITIES IN TERMS OF THESE CRITERIA, SURVEYED 15 OTHER COLLEGES TO LEARN ABOUT THEIR PRACTICES, AND MADE RECOMMENDATIONS FOR IMPROVEMENT. METHODS AND RESULTS OF THE STUDY ARE DESCRIBED, AND CONSIDERATION IS GIVEN TO BUILDING AND FINANCING OF PARKING STRUCTURES, AND TO DIMENSIONS AND PATTERNS OF PARKING STALLS UNDER VARIOUS CONDITIONS. (WO)

ERIC

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MACOMB COUNTY COMMUNITY COLLEGE

DIVISION OF RESEARCH AND DEVELOPMENT

14500 Twelve Mile Road
Warren, Michigan 48093

MARCH 31, 1967

JC 670 717

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INTRODUCTION

There are relatively few institutions of higher learning in urban areas that are not confronted with problems involving the automobile. The accelerated use of automobiles has made it difficult for institutions to accomodate the increasing number of vehicles seeking access to, and parking on, their campuses.

When many institutions of higher learning were established, there was little reason for administrators to be concerned about congested access routes and parking; they presented no immediate problem. Existing streets and public transportation served quite adequately. At institutions of higher learning, most students lived on campus or in areas close enough to the campus to walk or use public transportation to get to class. It was rare for a student to have a car, and if he did, it was a luxury, not a necessity. With hospitals, high schools and similar institutions, the situation was the same. On-street parking was sufficient to accomodate hospital visitors' cars, and it was uncommon for high school students to own or drive their own automobiles.

The picture has undergone turbulent change; crowded classrooms, more people, greater urbanization, and more extensive use of the automobile have combined to bring about the present plight.

The United States is rapidly becoming a nation of city dwellers with more than half the population living in or around the 168 cities classified as "metropolitan areas". By 1975, it is estimated that 70 per cent of the total population will live in the major cities.

The sprawling growth of cities means less density of population, which in turn means greater dependence on the automobile and less use of public transportation. Mass transit traffic, which reached its peak in 1946, following the end of World War II, has been steadily declining since and there is every indication that this decline will continue. It portends more congestion, greater demands for parking, and longer commuter distances. Time has replaced distance in choices relative to places of work, education, business, and recreation.

Tremendously increased volumes of traffic have overtaxed the capacity of streets in which there has been relatively little change in design in the last fifty years. Improved highways are bringing cities closer together, but at the same time, emptying greater numbers of automobiles into inadequate, outmoded street patterns. This compounds the problem of local traffic and parking.

In 1958, motor vehicle registrations in the United States totaled 68 million, compared to 41 million in 1948. According to recent estimates of the Secretary of Commerce, this figure will reach beyond 100 million by 1971 and at least 115 million by 1975. Automobile use has experienced a similar burgeoning. By 1971, annual vehicle miles traveled will total approximately 1,050 billion, and 1,200 billion by 1975. These facts indicate that the availability and convenience of the automobile as a means of transportation have changed the habits and attitudes of the American people. Walking, even for short distances, is considered passé. Drivers want to get to their destinations as quickly and as con-

veniently as possible and expect parking places convenient to these destinations to be provided.

Some students and faculty members commute fifty or more miles a day. Some institutions, expanding their campuses to provide for burgeoning enrollments, have made it difficult for students to walk to distant points on the campus within the time allotted between classes. This complicates the traffic and parking problem.

The phenomenal increase in the nation's population is one of the major contributing factors to the present issue of traffic and parking. In 1960, the National Census was 179 million people. Projections indicate the following:

1970 - 214 million

1975 - 225 million

The problem of access and parking facilities at institutions of higher learning is one in which relatively little study and research has been done. This may be due to the fact that the problem is a relatively new one for most large institutions, and some smaller institutions have no such difficulty. Another reason may be the attitude of the governing bodies of institutions. Some recognize that the transportation of students and staff is a matter of serious concern; some minimize the matter; others reject the problem with the view that there is no space available on the campus and perhaps, in time, the problem will resolve itself.

Another valid reason is that often space for parking facilities is either scarce or not available and that priority should go to instructional areas.

Nevertheless, administrators of institutions of higher learning more and more recognize the parking and access problem for what it is. Many institutions of higher learning, particularly urban and commuter institutions, are viewing the matter of parking very realistically and are giving it critical consideration in plans for the future.

PARAMETERS AND PROCEDURES FOR PRESENT STUDY

A. Sample data was compiled on instruments designed to show utilization of the total available parking spaces at the South Campus from 7:00 a.m. to 11:00 p.m., Monday through Friday, January 9-13, 1967, and March 6-10, 1967. Tabulations were made each hour on the half-hour. See Appendix A.

B. Sample data was analysed and displayed on frequency curves designed to display a visual and graphic representation of current parking lot utilization by time period and by the day.

C. All lots were analysed to show percentage of utilization by hour, day, and week, including a two-fold analysis of Faculty and Student Lot #1, order of usage, and maximum utilization by hour, day, and week.

D. New parking layouts were designed (90^{o}, 60^{o}, 45^{o}) with parking line directions changed to face the campus for analysis and comparison with present layouts. See Appendices B, C, and D.

E. A comparative analysis of parking lot utilization data was made on information received from (15) selected two- and four-year Michigan institutions of higher learning.

F. Tabulations of utilization of public transportation by the campus population were made by day and by week, January 9-13, 1967, and March 6-10, 1967.

G. Correlations of peak parking periods with peak room utilization periods were made for the dates January 9-13, 1967, and March 6-10, 1967. See Appendices E and F.

PARTIAL REVIEW OF RELATED LITERATURE

INCLUDING ANECDOTAL INFORMATION:

1. Agenda Item 8.2, October 19, 1965, MCCC - Robertson
2. American Education, May, 1966 - Du Von
3. Architectural Graphic Standards - Ramsey and Sleeper
4. Automatic Parking Devices - Wigle
5. Bethlehem Steel Company - Bengston
6. Campus Planning - Dober
7. Eberle M. Smith Associates Inc. - Sestock & Wheeler
8. Engineering Consultant - Zodas
9. E N O Foundation for Highway Traffic Control
10. Guide for Planning Community College Facilities - Merlo
11. Harley, Ellington, Cowin, and Stirton, Inc. - Jones
12. Lawrence Institute of Technology - Pellerin and Montgomery
13. Lingeman and Associates - Lingeman
14. National Garages, Inc. - Stocks and Mattingly
15. O'Dell, Hawlett, and Luckenbach - Madison
16. Parking Control Equipment - Western Industries, Inc.
17. Portland Cement Association - Krell
18. R. C. Rich Associates - E. Haverty
19. University of Detroit - Trupiano
20. University of Michigan - Poole and Telfor
21. Wayne State University - Dodge

GENERAL PRINCIPLES RELATING TO THE CONSTRUCTION AND ORGANIZATION OF PARKING FACILITIES

1. The architectural design of parking spaces determines whether the stalls would normally be rated as either space tightly used, but adequate, or a comfortable amount of space.

Regardless of the size of the parking lot, there should be enough space to allow freedom of movement for maneuvering vehicles.

The number of square feet per stall is not a positive guide as to the sufficiency of space in a parking lot. Variations in the configuration of a parking area can cause differences in the number of square feet of space per stall. These factors should be considered in the qualitative relationship of the number of stalls to the total area of the parking lot.

2. Entrances and exits should be well defined and as few in number as practical to provide for peak hour demands. The entrances and exits should be positioned so that they have minimum effect on the movement of traffic on adjacent streets and should be placed a minimum of fifty feet from the intersections.

The space reservior at entrances and exits where they are directly adjacent to busy thoroughfares is important and should be included in the design of the parking lot. Space to accomodate the accumulations of incoming vehicles prevents backup in busy traffic lanes particularly where controlled entrances are employed. Reservoir space is also important at the exits where control systems are used.

A desirable feature in the design of parking lots is to position the entrances and exits to favor right hand turns into and out of the parking lots wherever possible.

3. Clear adequate control signs are important to the efficiency of operation of a parking facility.

Stall lines should be clearly marked for all patterns whether they are right or acute angle designs. Double lines between stalls joined on the aisle side and extending three-fourths of the length of the stall aid in inducing orderly parking.

In layouts employing acute angle designs, directional arrows, both pavement mark and eye level types, are desirable for one-way traffic controls. The exits and entrances should be clearly marked and the signs should be visible from all parts of the lot.

4. The successful utilization of a parking facility depends largely upon the various factors which are part of its design: ingress and egress, layout of stalls and aisles, and landscaping.

The efficiency of a parking facility is not assessed merely by the number of vehicles it may contain. Its utility and successful operation require that consideration be given to every factor that can improve the speed and quality of service, internal movement, the ease and safety of access to and from public streets, the amount of area assigned for maneuvering, and the general convenience and safety of the person parking.

5. Parking for faculty and staff, parking for visitors, and parking for students who commute constitute the necessary program. Remaining demands are general requirements. An optimum campus parking program should include all necessary parking and as much

general parking as site conditions and financing will allow.

6. The modern commuter college campus is dominated by the automobile. This is a pressing reality since the suburban college can usually be reached by no other means. The decline of public mass transportation, the increase in production and availability of automobiles, and perhaps, the car as a status symbol have resulted in a proliferation of the problem of campus parking.

Cars have changed from a luxury to a convenience, and more often, to a necessity. Current construction costs for paved surface parking lots are approximately $.45 per square foot. However, the real expense to an institution exists because parking is a large <u>consumer of land</u>. Each parking stall requires approximately 300 square feet of space. A parked car occupies more area than that needed for housing one student. Two hundred students could be given instruction in the area occupied by twenty cars.

MACOMB COUNTY COMMUNITY COLLEGE - SOUTH CAMPUS

PARKING FACILITIES IN USE

South Campus, MCCC

Parking lots 1-5

	Parking lot	Capacity	Total sq.ft.	Sq.ft./stall	Acreage
Hard top	#1	528	159,192	301.5	3.65
Slag	#2	480	144,720	301.5	3.32
Slag	#3	612	183,600	300.0	4.21
Hard top	#4	645	190,152	294.8	4.36
Hard top	#5	544	162,792	299.3	3.74
TOTALS	5	2,809	840,456		19.28

South Campus Headcount (Fall, 1966) - 6,231
Faculty and Staff 742
Total Headcount 6,973

Ratio of students/stall - 2.5 at South Campus
Average square feet/stall - 299.2 sq. ft./stall

*Information derived was based on the following assumptions:

1. that enrollment September, 1967 will total 12,755
2. that classroom facilities will be available for projected ratios at the South Campus

	South Campus	MCCC	
Sections -	787	1,226)	---off-campus enrollments in extension centers--3,476 of which approximately 2,200 are industrial technology students
Headcount -	6,231	9,707)	
Projected 1967 Headcount -	8,188	12,755	
Faculty and Staff -	742		
Total Stalls -	2,809		

1. $\frac{787}{*6,231} = \frac{1,226}{9,707}$

2. $\frac{6,231}{9,707} = \frac{*8,188}{12,755}$ *31.4% increase in student enrollment at South Campus

3. $\frac{742}{6,231} = \frac{*975}{8,188}$ *31.4% increase in faculty and staff at South Campus

Ratio of users/stall

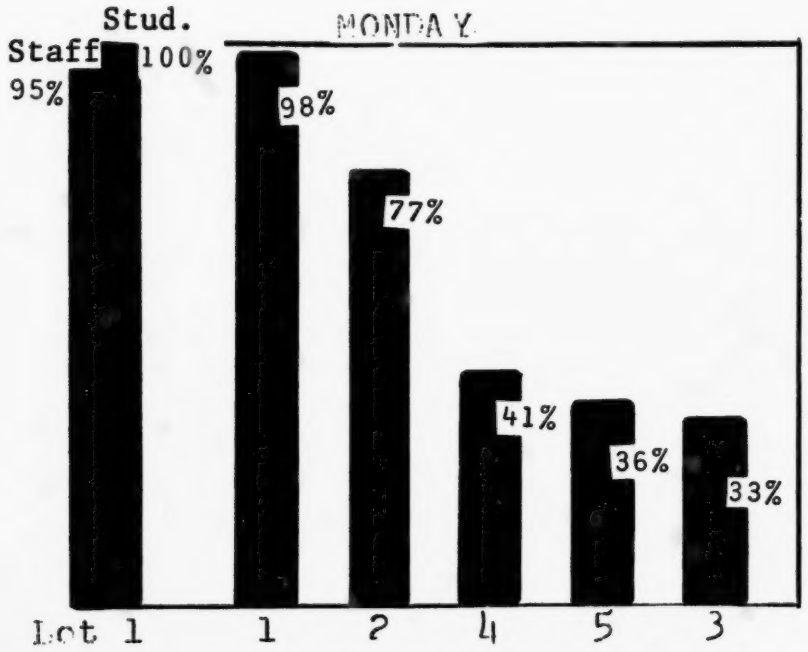
6,231	Present headcount
742	including faculty and
6,973	staff at South Campus

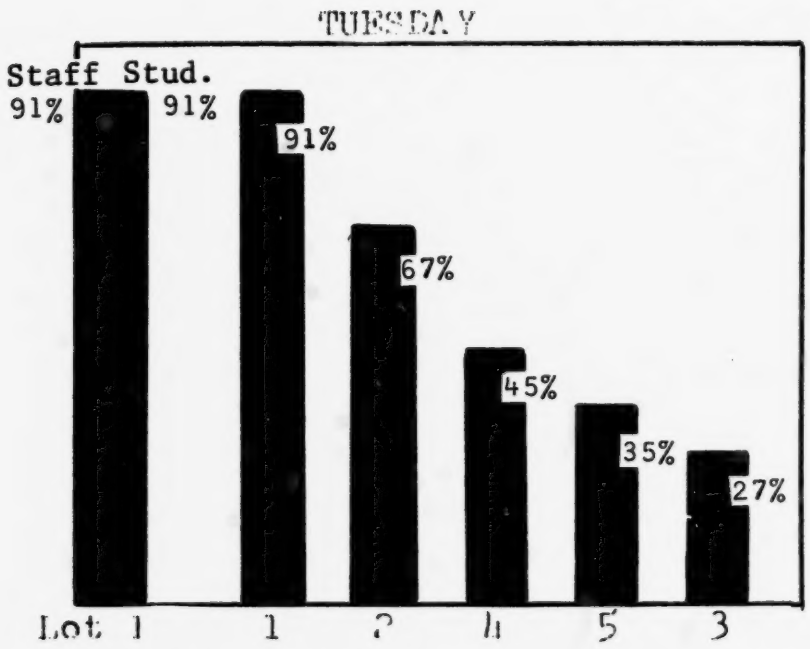
South Campus-2.5 users/stall

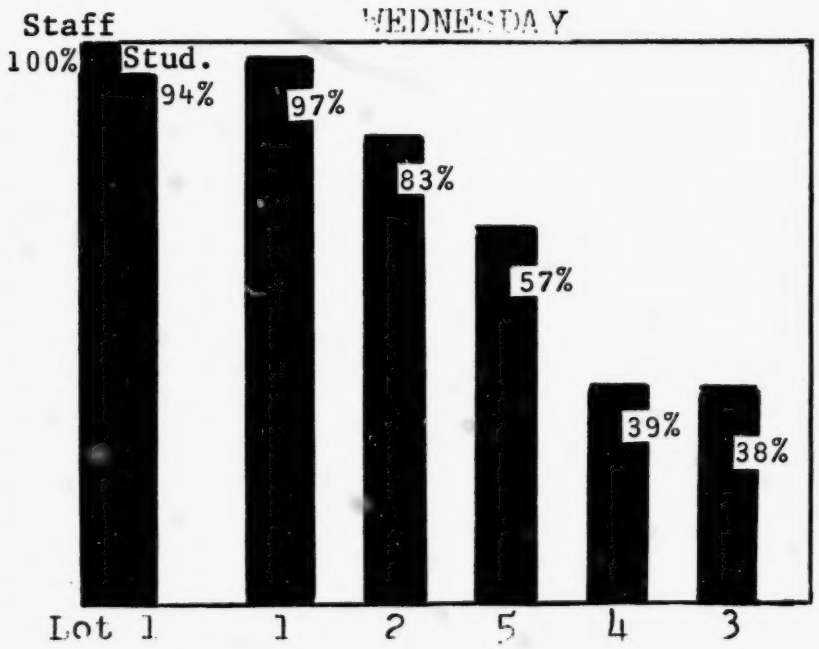
South Campus-Projected ratio 3.3 users/stall

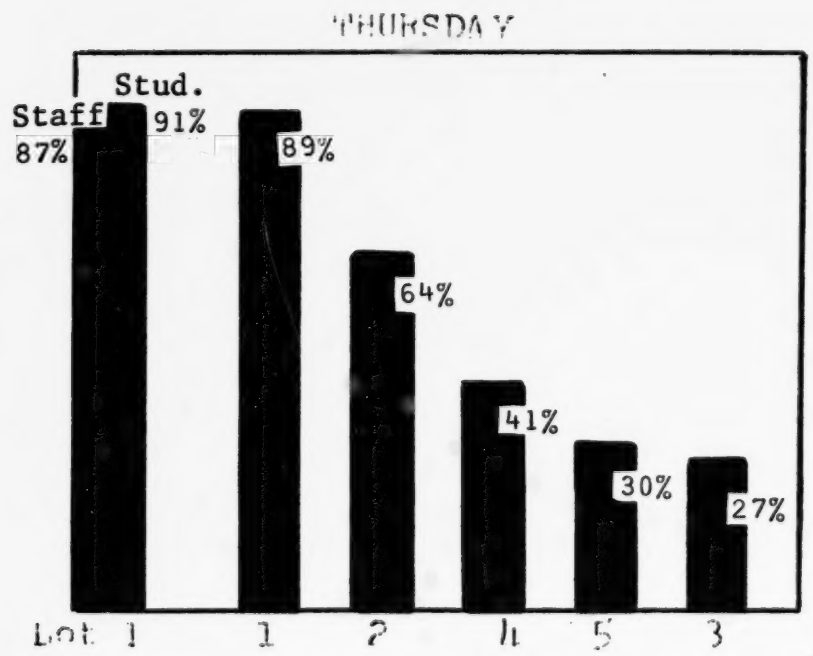
8,188	Projected headcount
975	including faculty and
9,163	staff at South Campus

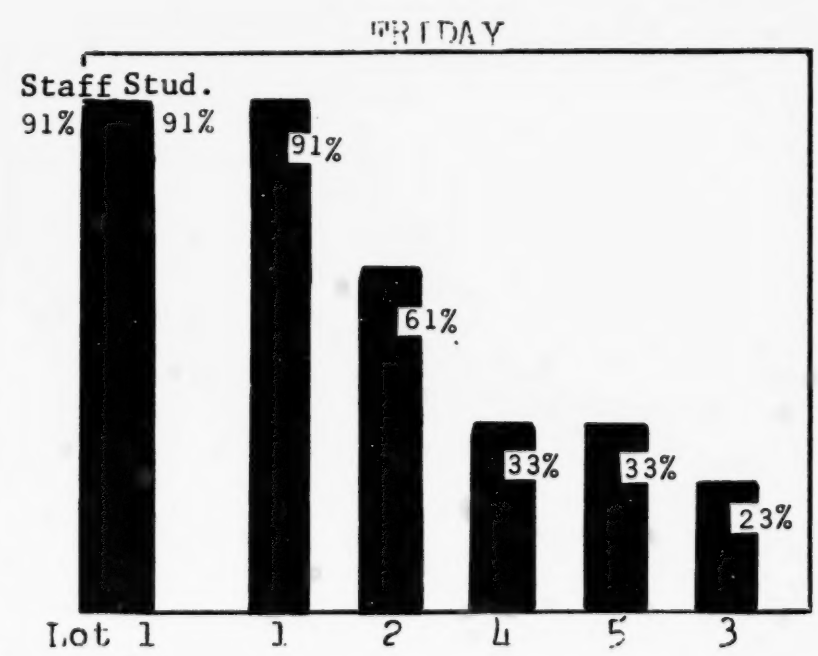
MAXIMUM UTILIZATION PER DAY OF EACH LOT
January 9-13, 1967







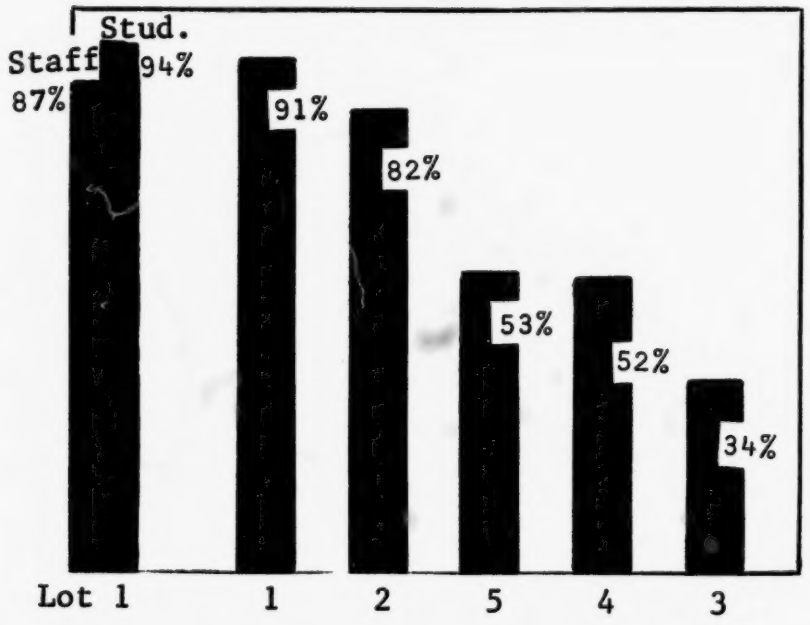




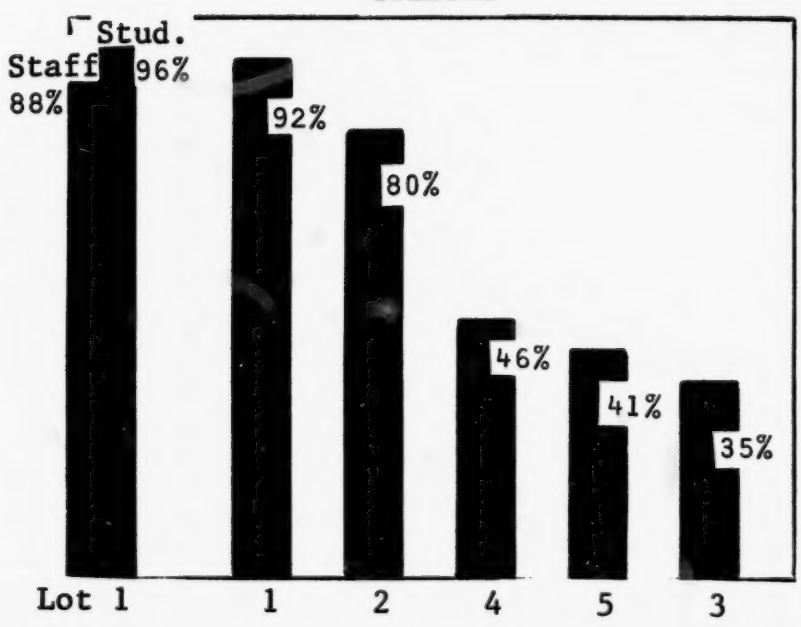
MAXIMUM UTILIZATION PER DAY OF EACH LOT

March 6-10, 1967

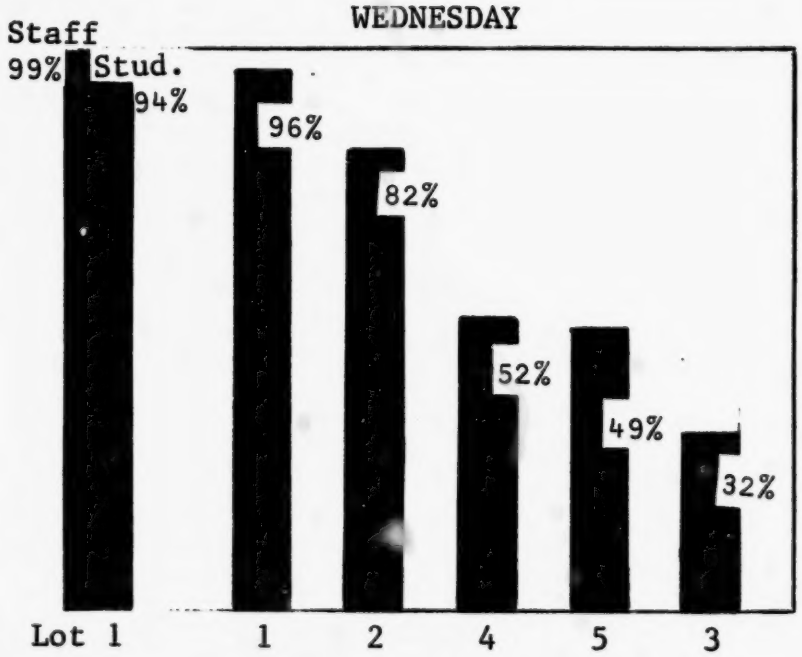
MONDAY



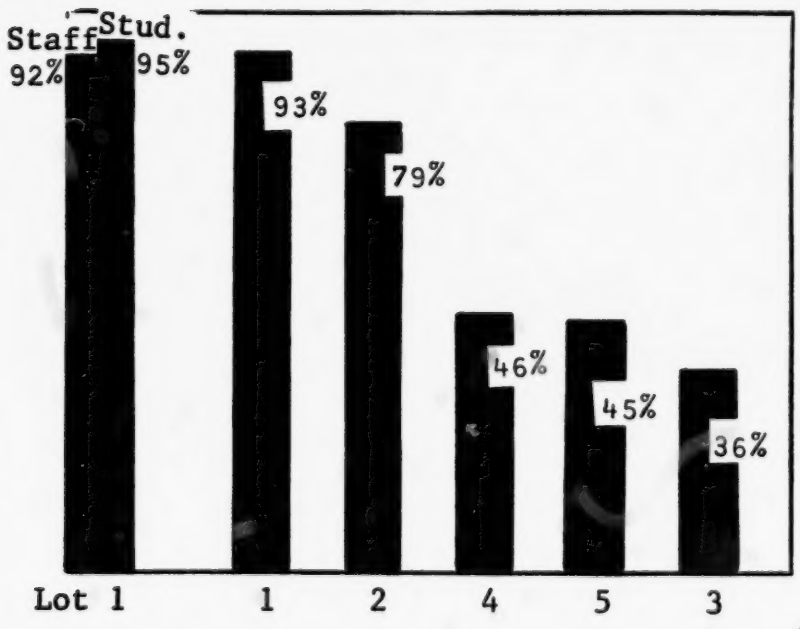
TUESDAY



WEDNESDAY



THURSDAY



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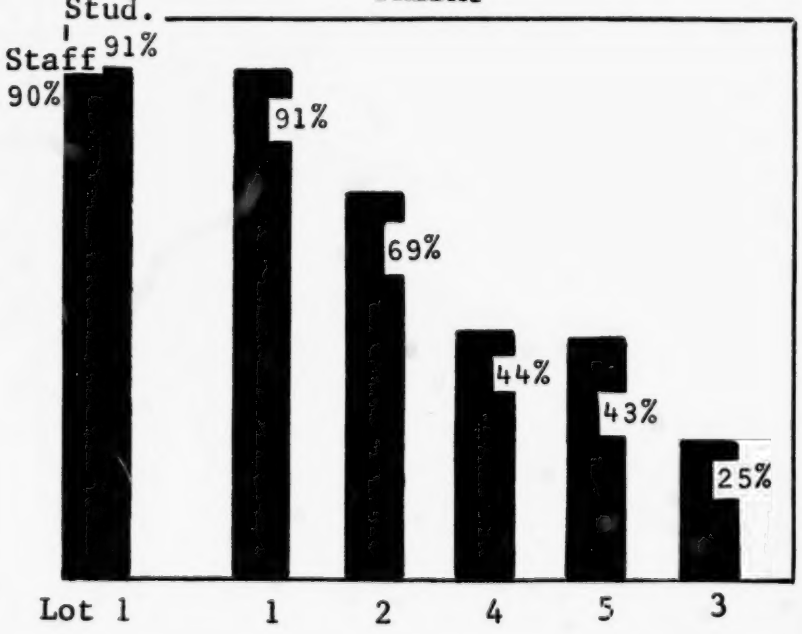
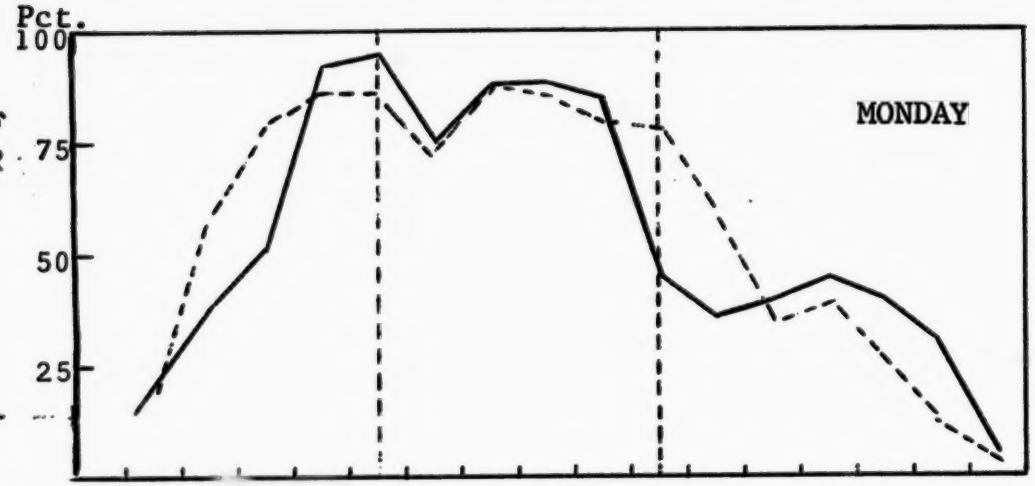


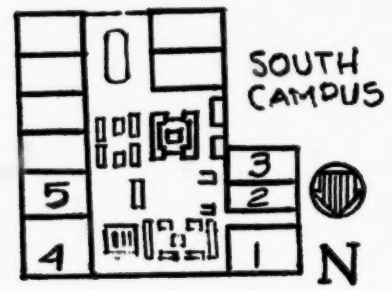
AVERAGE PERCENTAGE OF DAILY UTILIZATION FOR

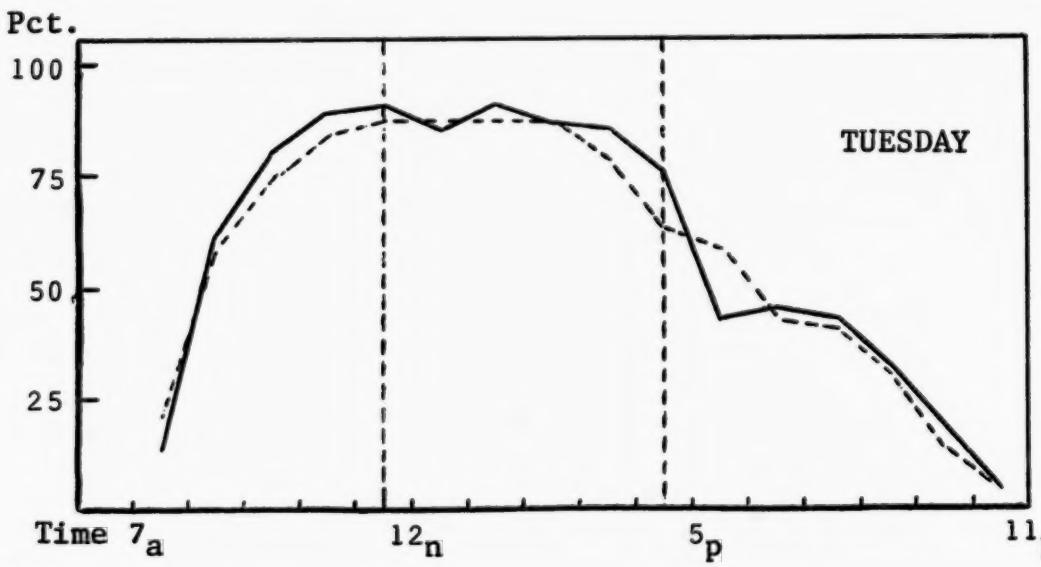
LOT NUMBER 1
faculty and staff

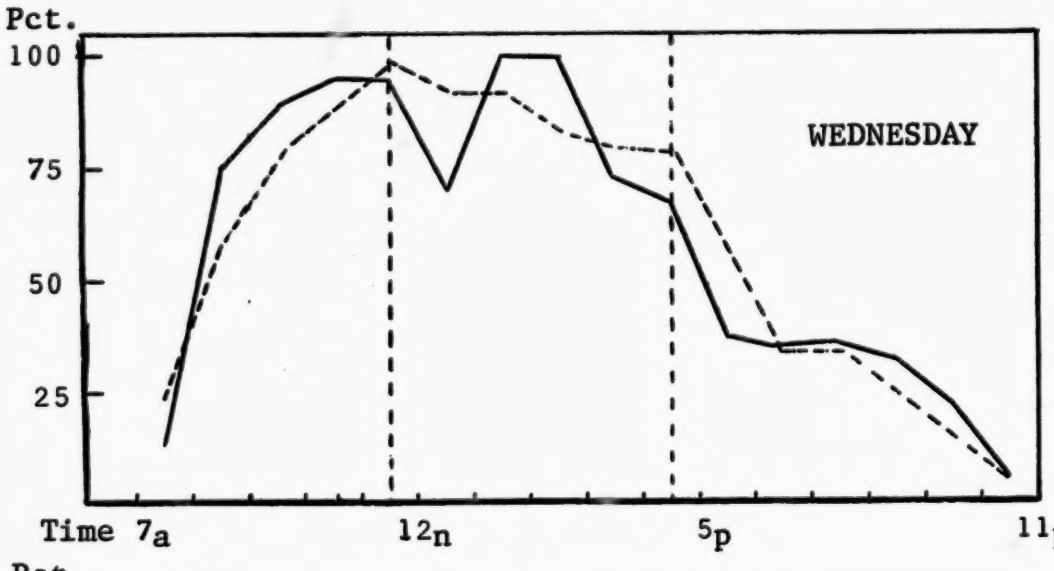
January 9-13, 1967 —

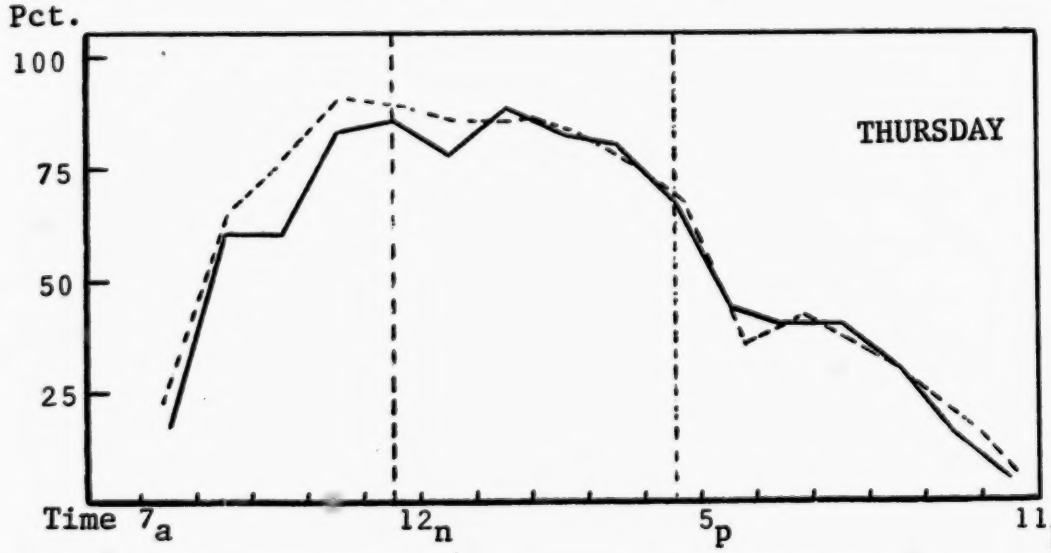
March 6-10, 1967 ----

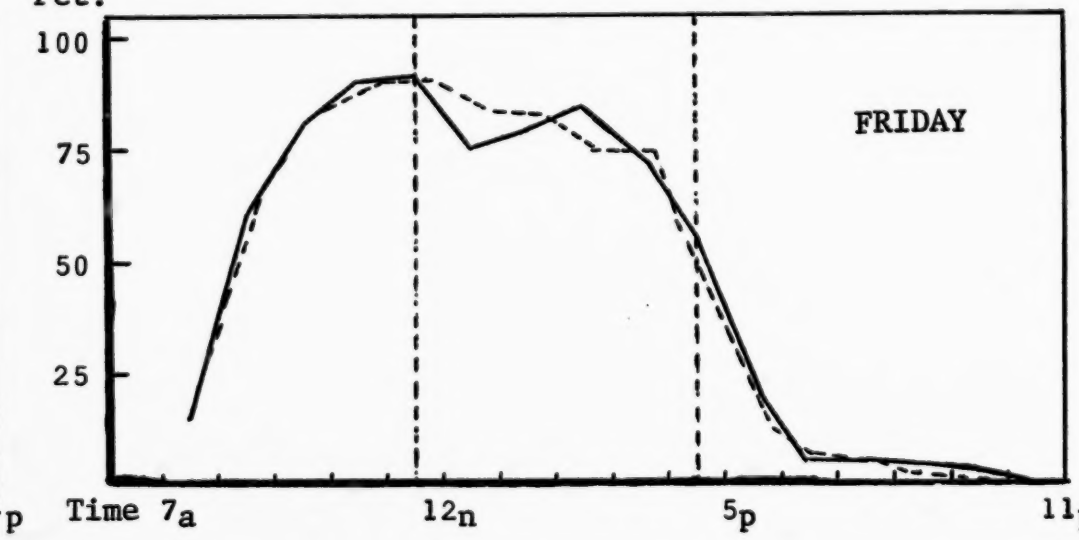










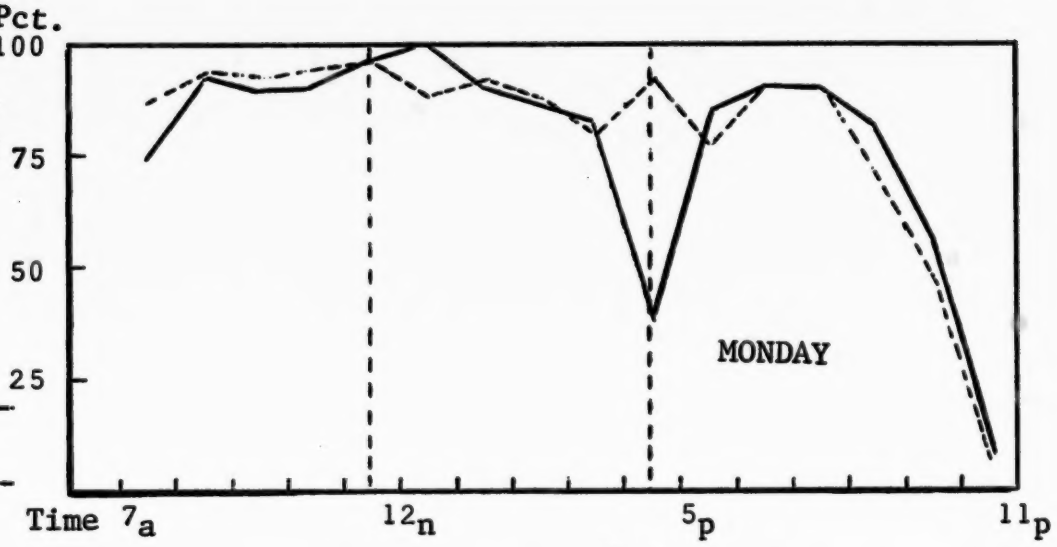


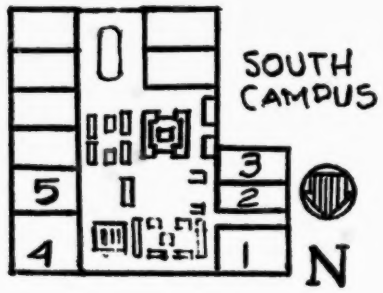
AVERAGE PERCENTAGE OF DAILY UTILIZATION FOR

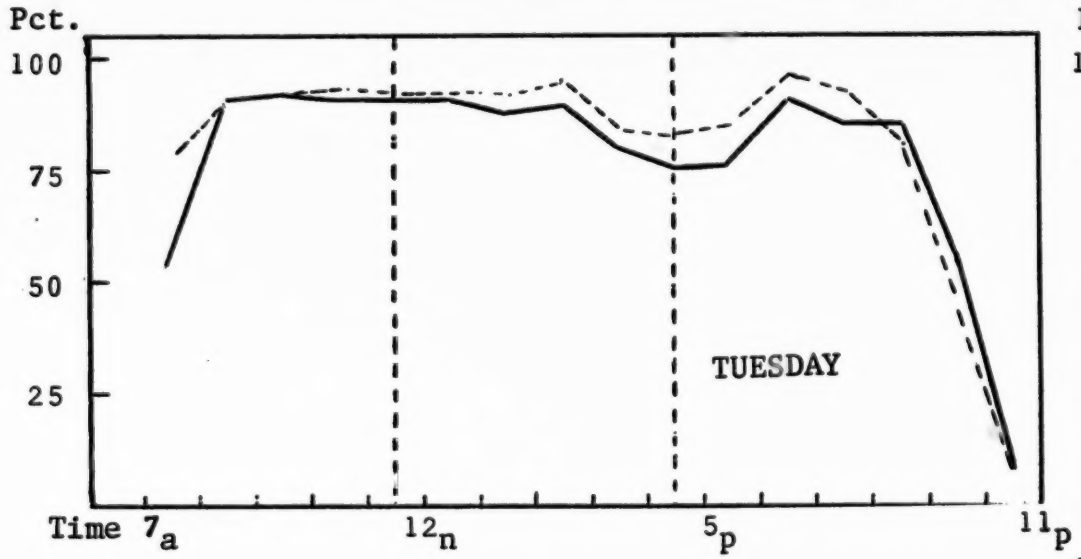
LOT NUMBER 1
student

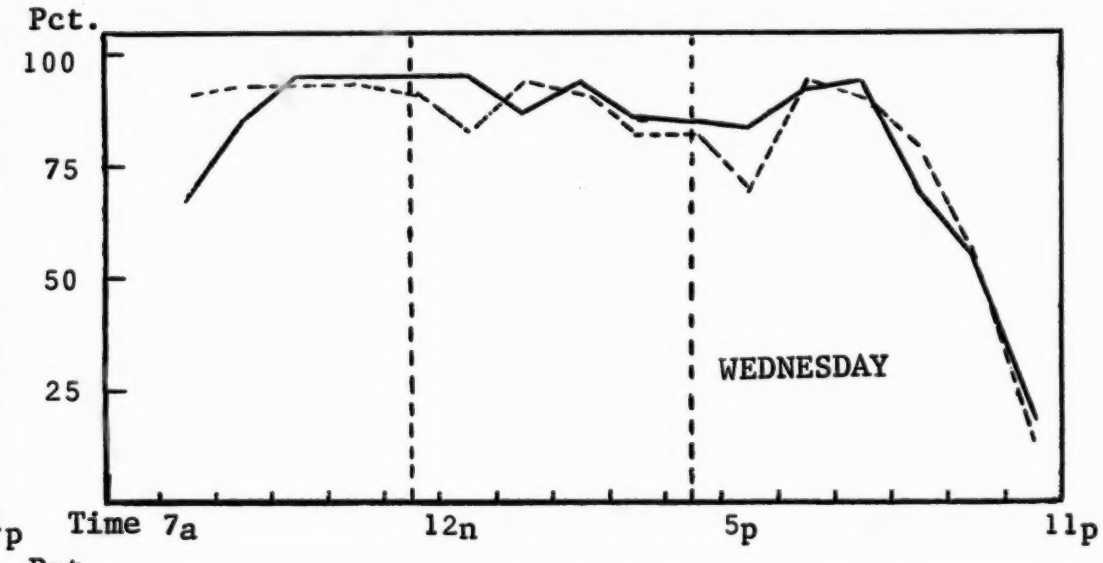
January 9-13, 1967 ——

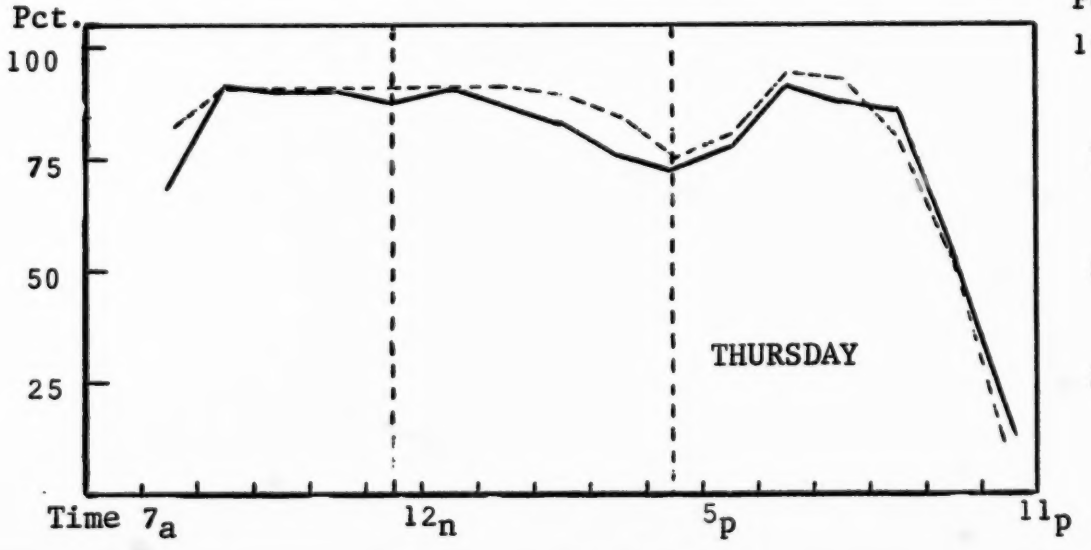
March 6-10, 1967----

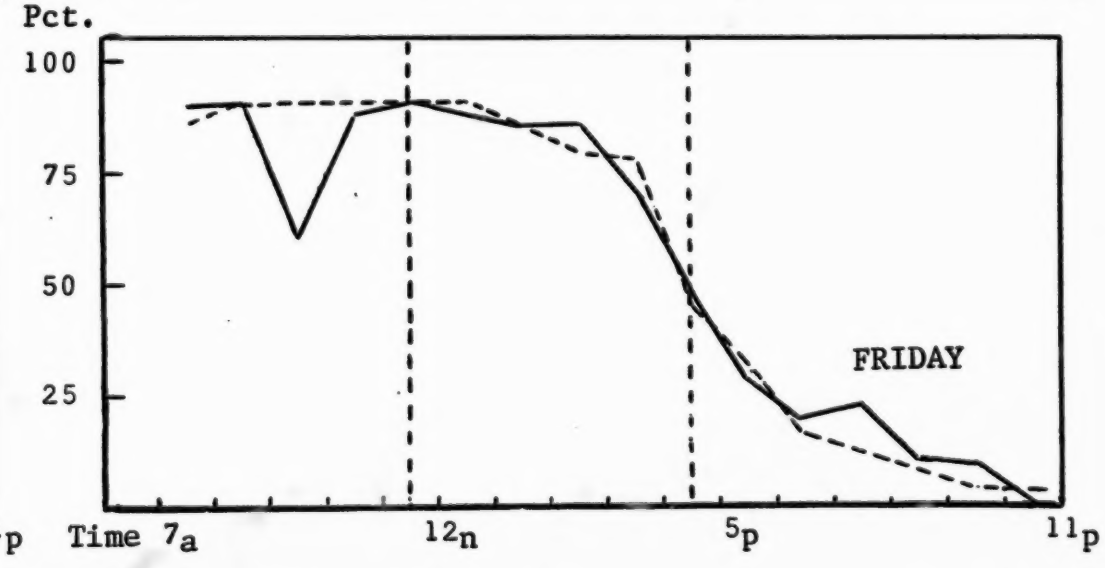










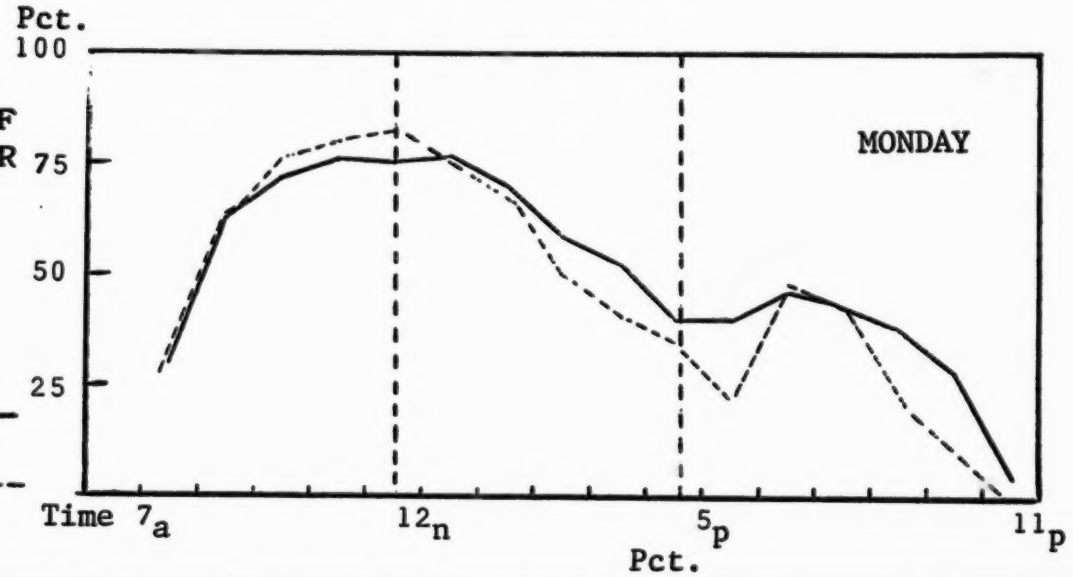


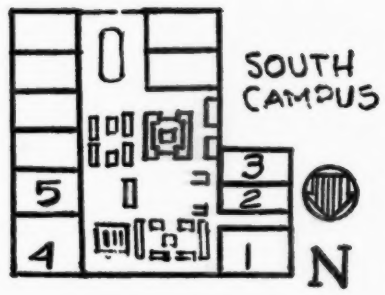
AVERAGE PERCENTAGE OF DAILY UTILIZATION FOR

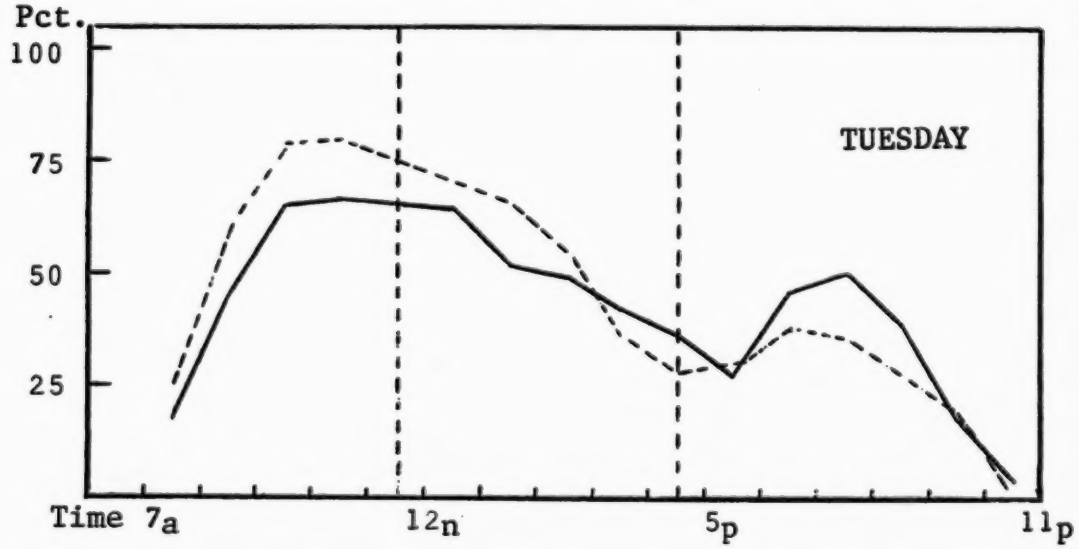
LOT NUMBER 2
student

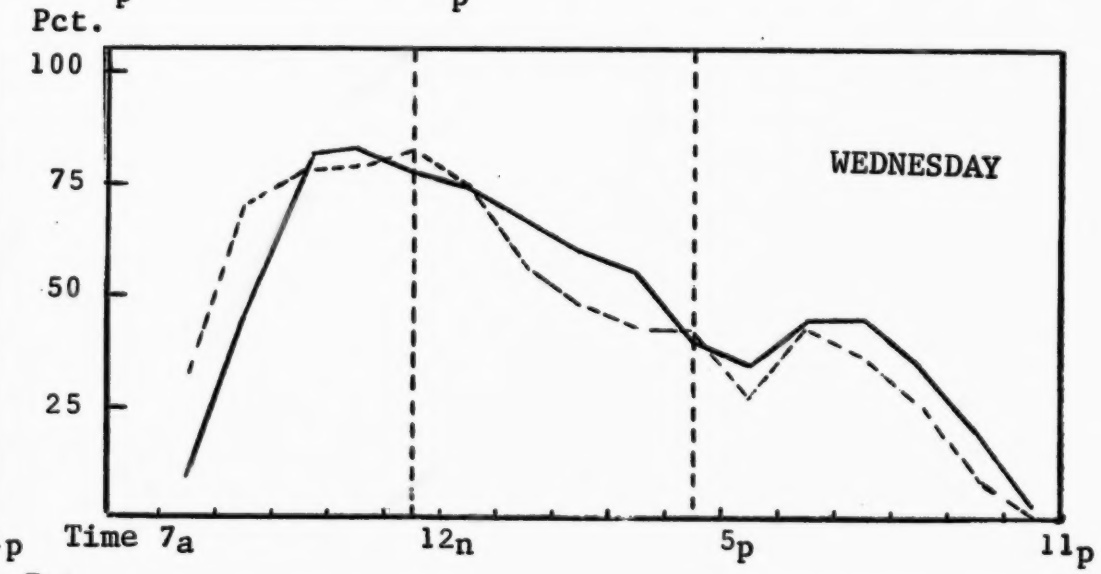
January 9-13, 1967 —

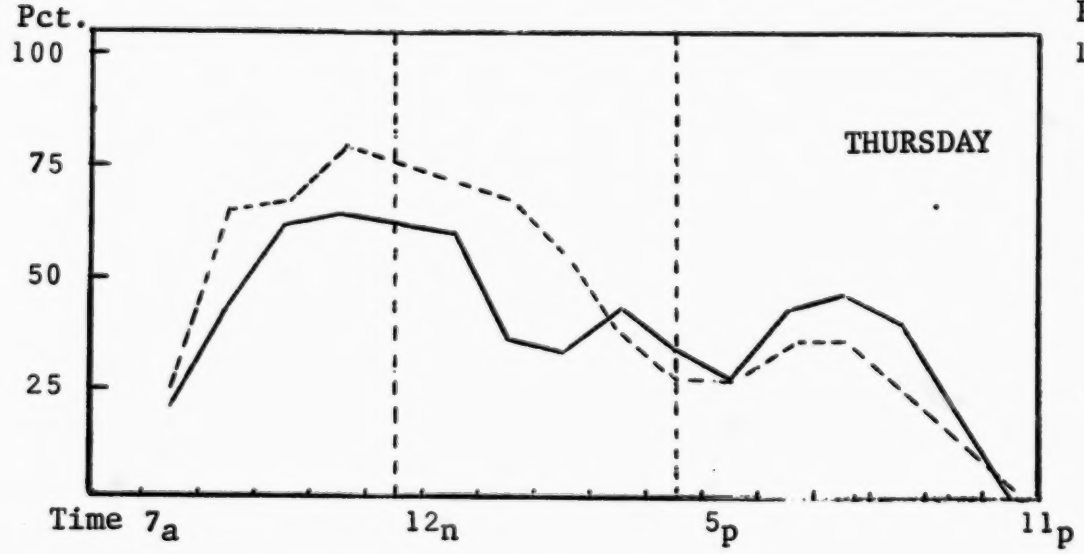
March 6-10, 1967 ---

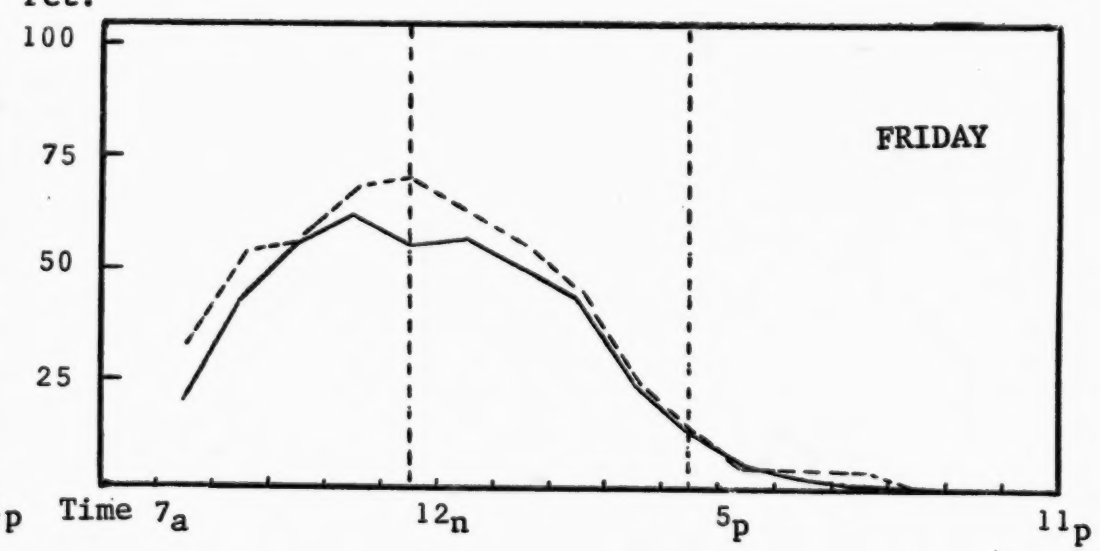










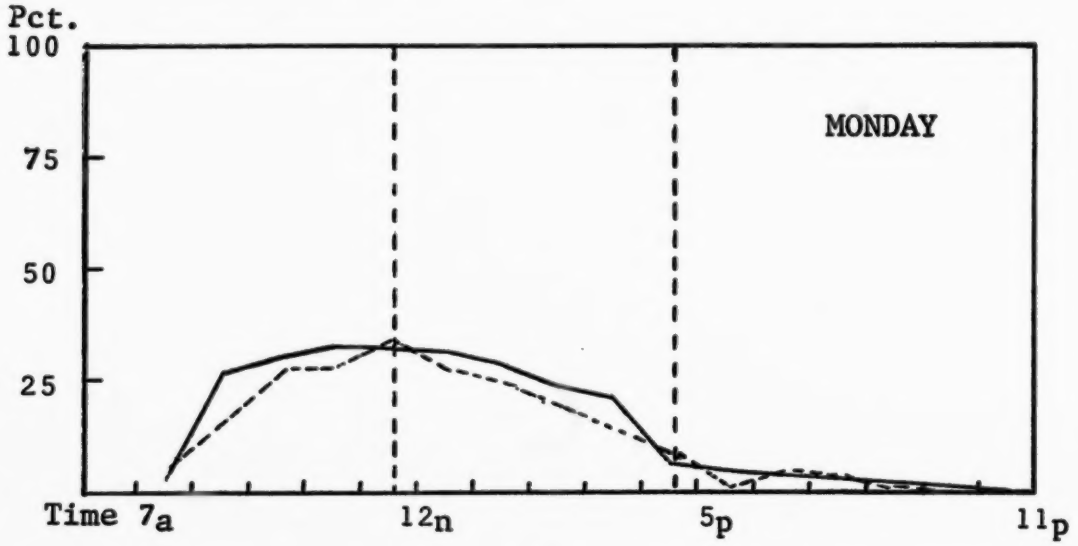


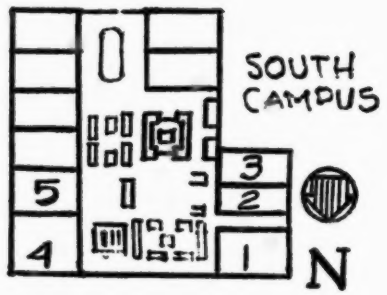
AVERAGE PERCENTAGE OF DAILY UTILIZATION FOR

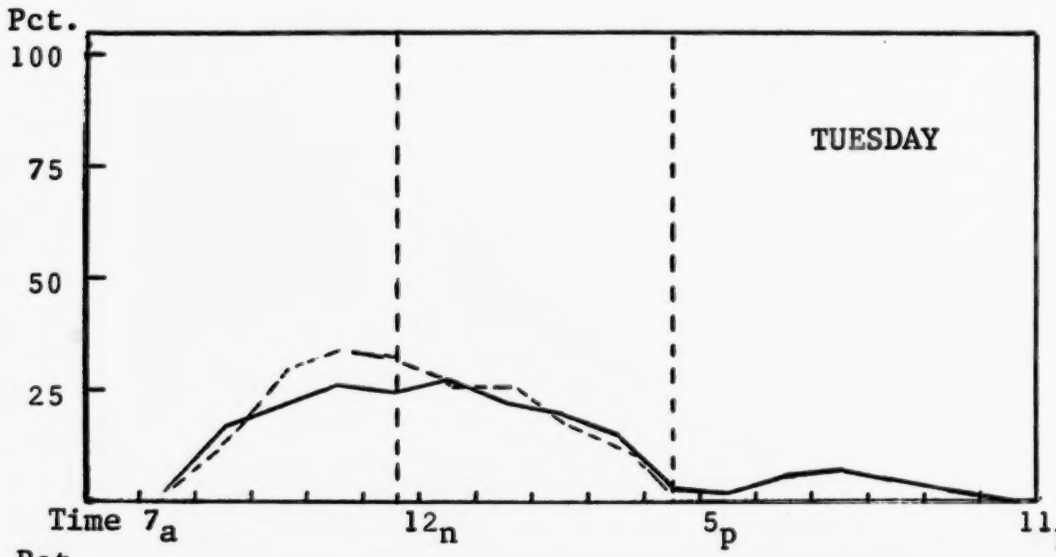
LOT NUMBER 3
student

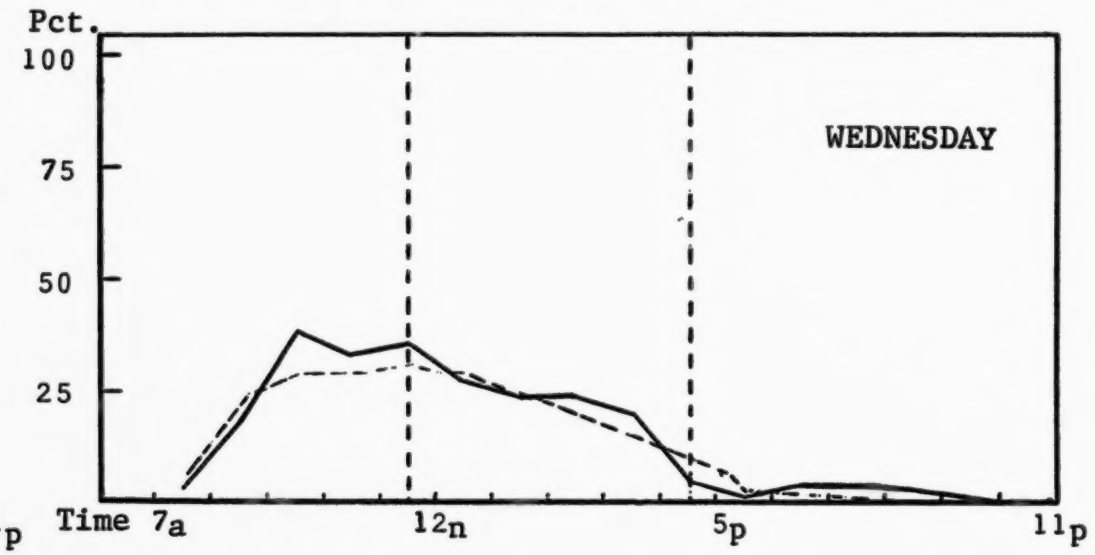
January 9-13, 1967 ——

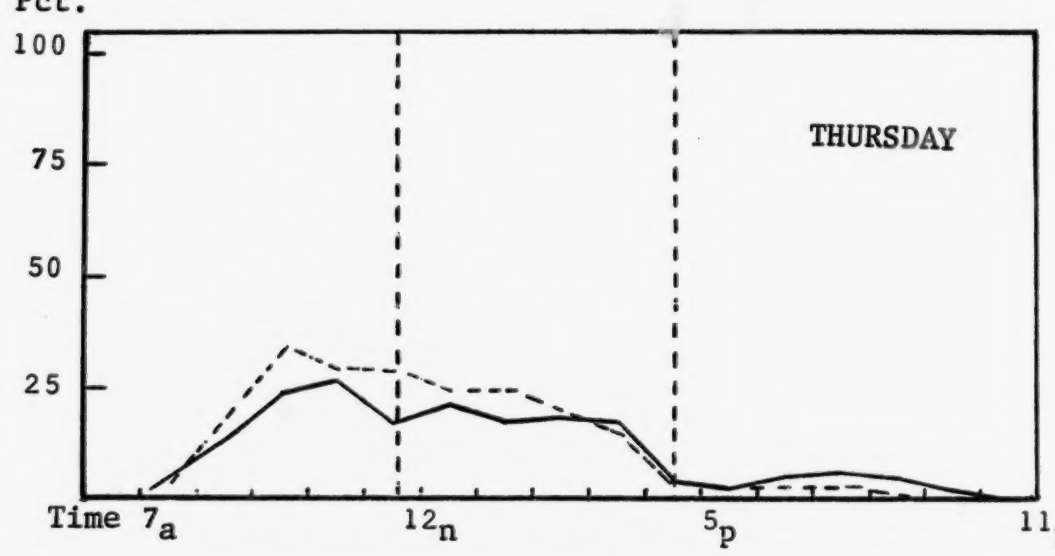
March 6-10, 1967 ---

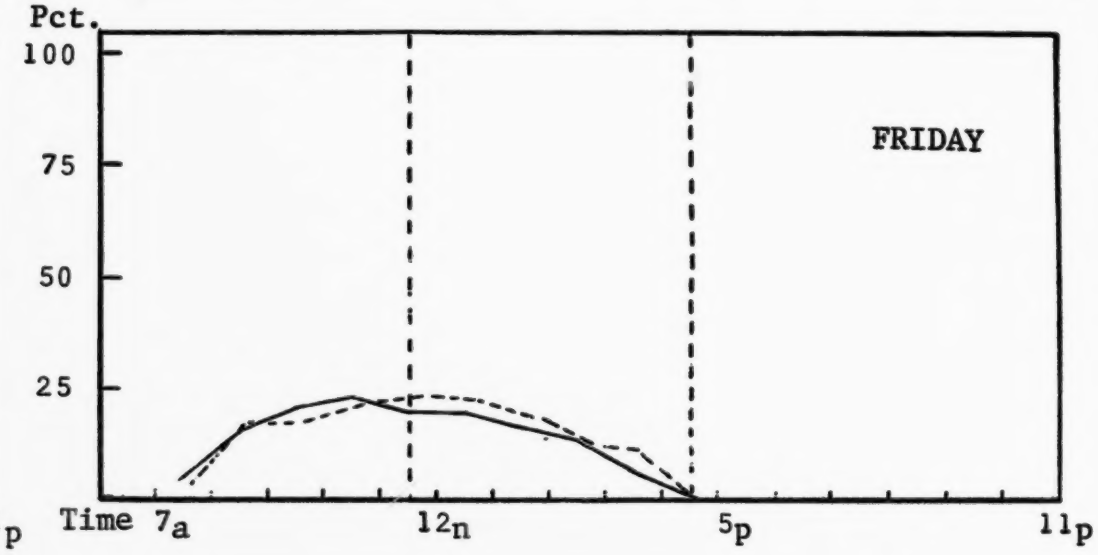










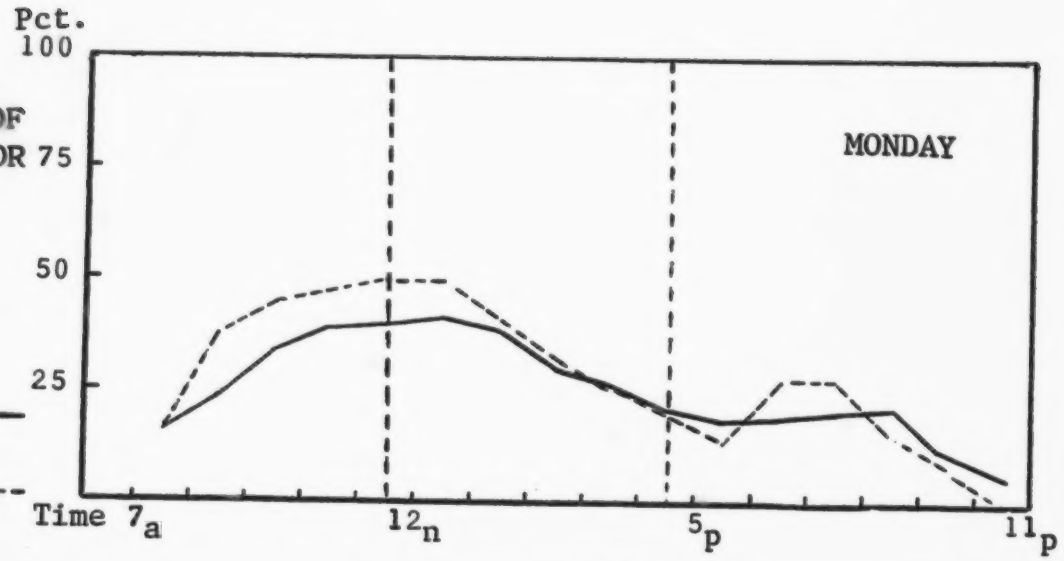


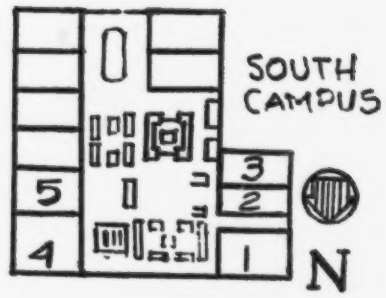
AVERAGE PERCENTAGE OF DAILY UTILIZATION FOR

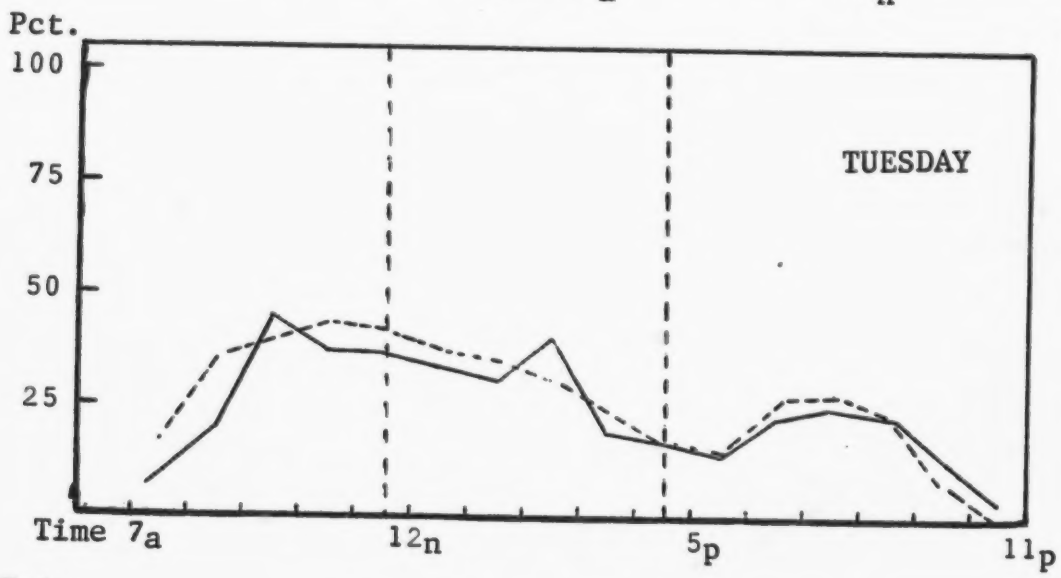
LOT NUMBER 4
student

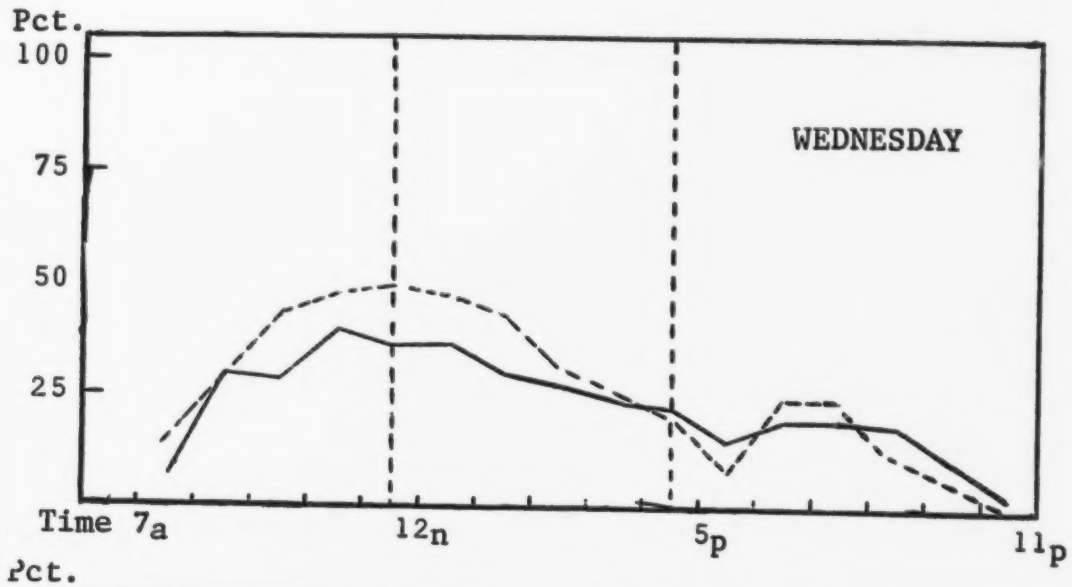
January 9-13, 1967 —

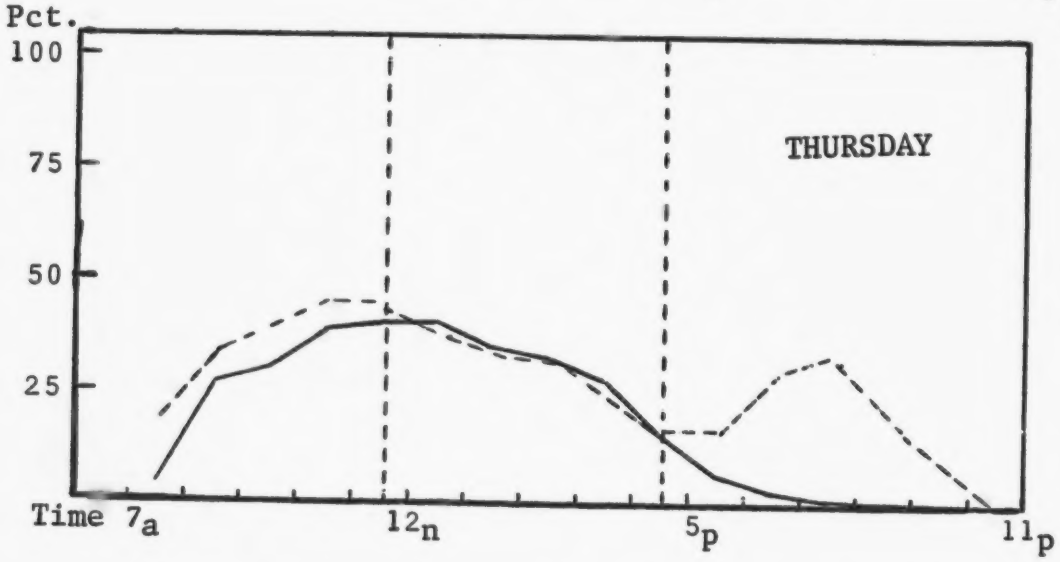
March 6-10, 1967 ---

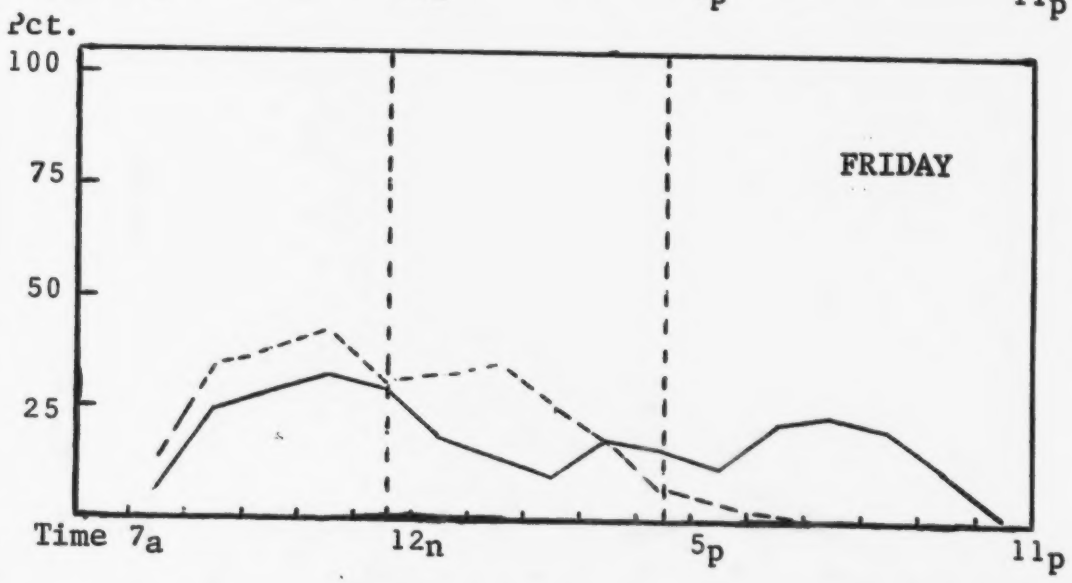










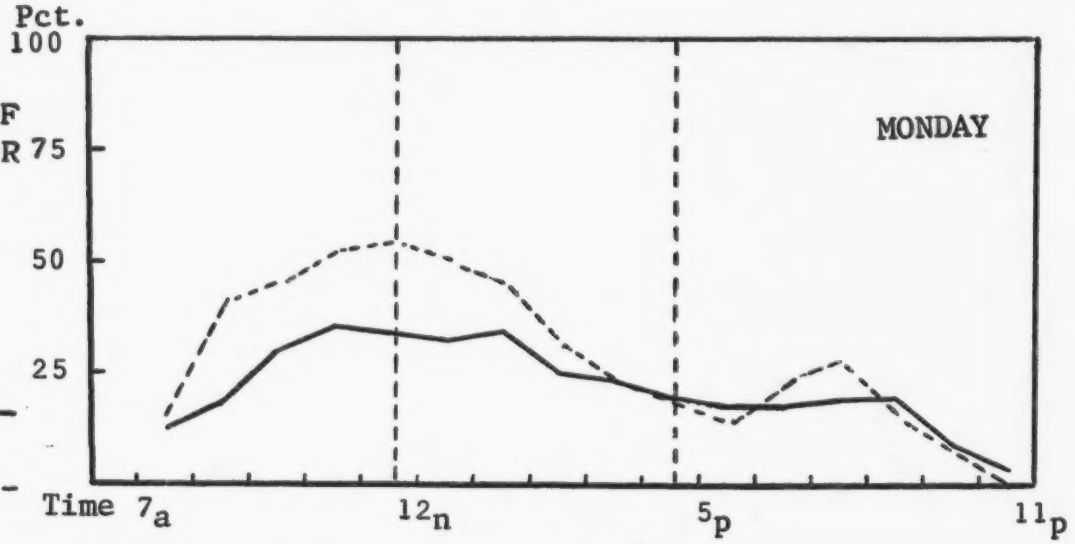


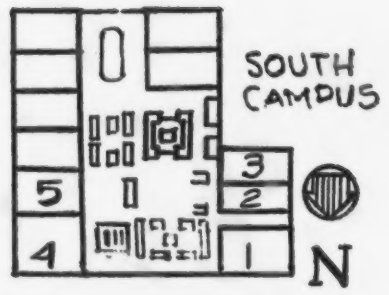
AVERAGE PERCENTAGE OF DAILY UTILIZATION FOR

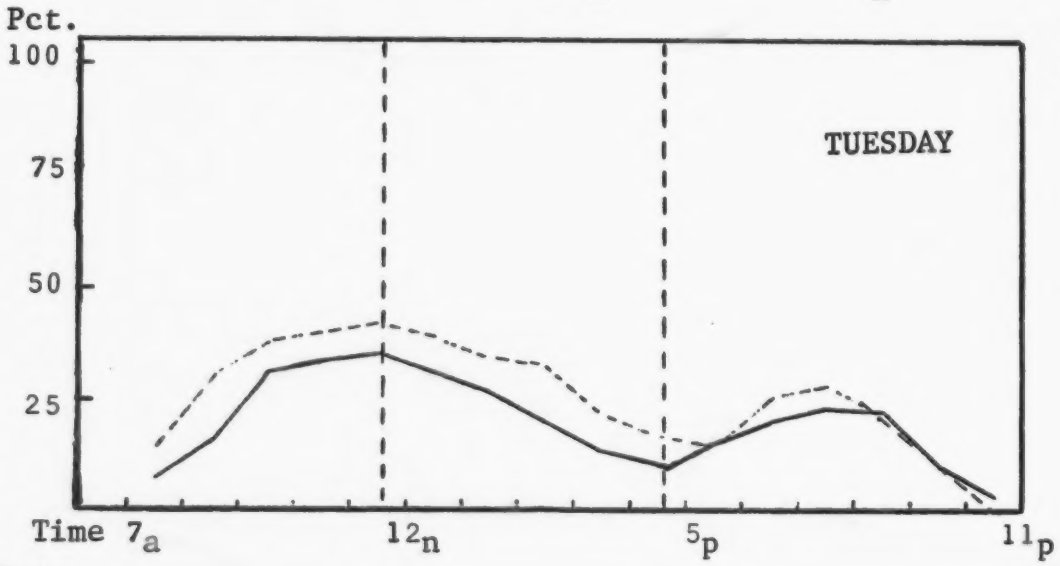
LOT NUMBER 5
student

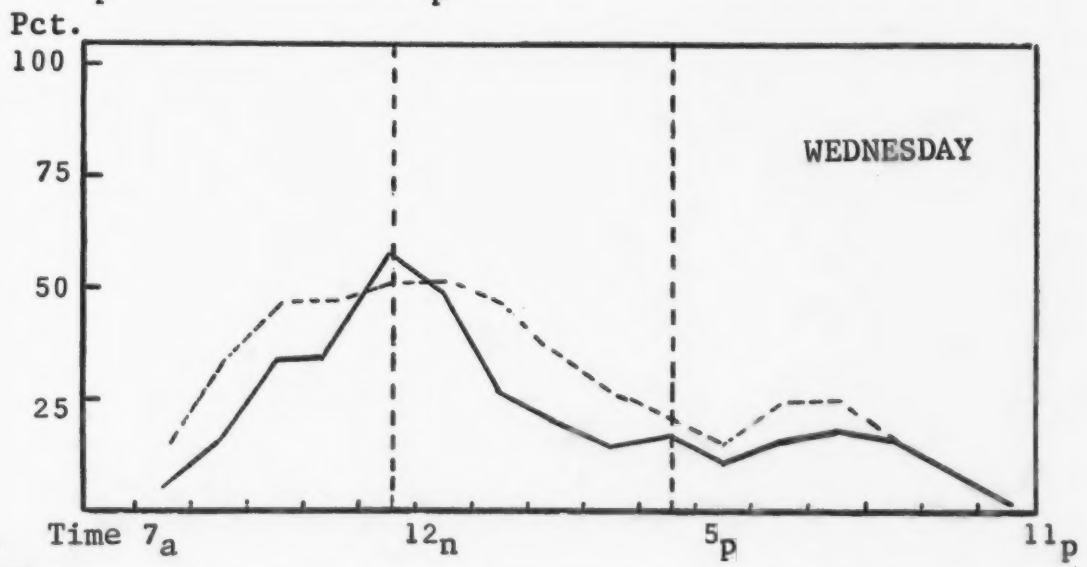
January 9-13, 1967 —

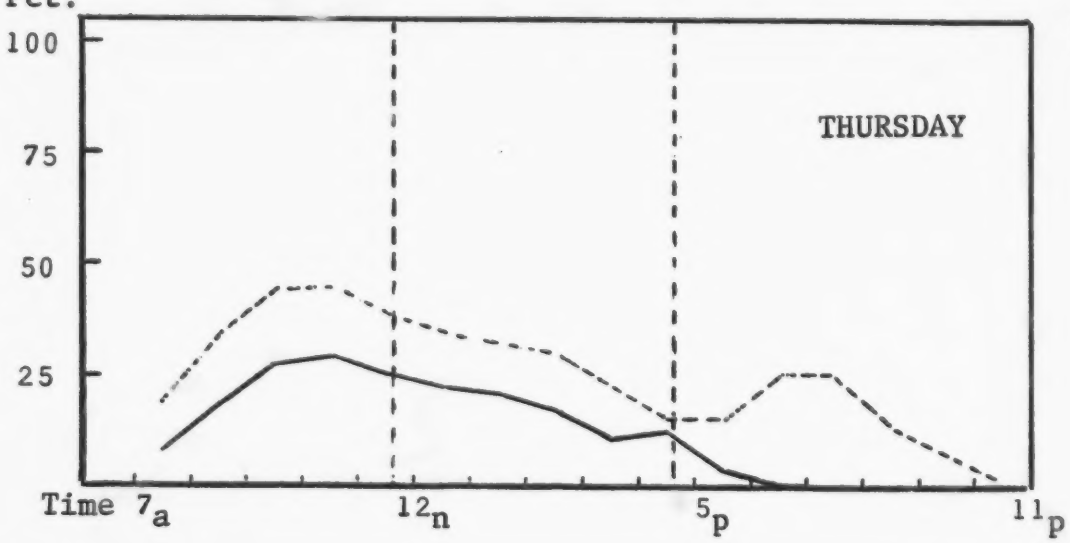
March 6-10, 1967---

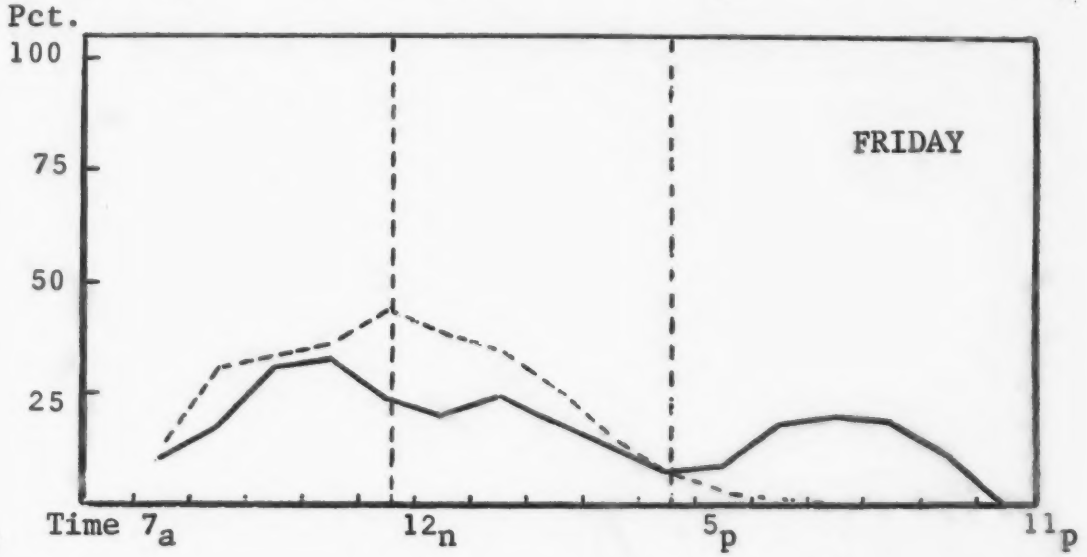












PUBLIC TRANSPORTATION (D. S. R.)

ARRIVAL AND DEPARTURE TABULATIONS

Date	Boarding	Alighting
January 9, 1967, Monday	117	109
January 10, 1967, Tuesday	122	98
January 11, 1967, Wednesday	115	106
January 12, 1967, Thursday	104	98
January 13, 1967, Friday	102	100
TOTAL	560	511

Average boarding per day = 112
Average alighting per day = 102

Date	Boarding	Alighting
March 6, 1967, Monday	149	159
March 7, 1967, Tuesday	130	118
March 8, 1967, Wednesday	146	101
March 9, 1967, Thursday	154	105
March 10, 1967, Friday	99	106
TOTAL	678	589

Average boarding per day = 135
Average alighting per day = 117

118 more passengers boarded in March = 17% increase
78 more passengers alighted in March = 13% increase

Approximately 90 more passengers per week presently board buses at MCCC than arrive. The indication may be that this number of passengers is brought to the College by parents and others, but returns home via public transportation.

PARKING LOT UTILIZATION BY HOUR, DAY, AND WEEK

South Campus, MCCC

Week of January 9-13, 1967

LOT # 1 CAPACITY = 528

PERCENT = Number of spaces in use expressed as a percent of all spaces available

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	WEEKLY	
TIME	PERCENT	PERCENT	PERCENT	PERCENT	PERCENT	CAPACITY	PERCENT
7-7:30	51.9	41.1	46.2	48.1	41.7	2640	45.8
8-8:30	70.8	78.6	81.1	78.6	77.8	"	77.4
9-9:30	75.2	86.9	91.8	77.7	87.1	"	83.8
10-10:30	91.7	89.8	94.3	87.1	88.8	"	90.3
11-11:30	95.6	89.8	93.9	86.5	91.3	"	91.4
12-12:30	90.0	88.6	84.1	83.3	83.1	"	85.8
1-1:30	89.8	88.8	92.6	88.4	82.4	"	88.4
2-2:30	87.5	88.1	96.8	84.6	85.4	"	88.5
3-3:30	84.5	81.6	80.5	78.8	72.3	"	79.5
4-4:30	40.7	75.0	77.8	70.8	50.9	"	63.1
5-5:30	65.1	62.7	64.0	63.4	25.7	"	56.2
6-6:30	69.3	72.9	68.2	70.5	14.4	"	59.1
7-7:30	72.2	68.6	69.1	68.6	15.9	"	58.9
8-8:30	64.2	64.4	54.2	63.6	8.5	"	51.0
9-9:30	45.1	39.6	41.5	38.4	7.2	"	34.4
10-10:30	7.9	9.3	11.5	10.0	0.6	"	39.4

PARKING LOT UTILIZATION BY HOUR, DAY, AND WEEK

South Campus, MCCC

Week of January 9-13, 1967

LOT # 2 CAPACITY = 480

PERCENT = Number of spaces in use expressed as a percent of all spaces available

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	WEEKLY	
TIME	PERCENT	PERCENT	PERCENT	PERCENT	PERCENT	CAPACITY	PERCENT
7-7:30	30.1	17.1	10.6	21.2	20.2	2400	20.0
8-8:30	62.9	44.2	44.8	42.1	42.7	"	47.3
9-9:30	71.9	65.0	81.9	61.2	55.6	"	67.1
10-10:30	75.2	66.9	82.3	63.9	61.0	"	69.9
11-11:30	75.4	66.0	77.7	63.5	54.6	"	67.5
12-12:30	76.7	64.4	73.9	60.6	56.0	"	66.3
1-1:30	69.4	51.4	67.5	36.4	49.8	"	54.9
2-2:30	58.7	48.9	59.8	33.1	42.9	"	48.7
3-3:30	52.7	42.9	55.4	43.7	23.9	"	43.7
4-4:30	38.9	36.9	38.9	33.5	13.7	"	32.4
5-5:30	40.2	27.1	34.8	27.9	6.2	"	27.3
6-6:30	46.4	46.0	44.8	43.1	2.9	"	36.7
7-7:30	44.6	50.6	44.4	46.4	1.0	"	37.4
8-8:30	37.7	38.3	34.6	40.0	.62	"	30.2
9-9:30	27.3	17.9	19.6	20.2	.20	"	17.0
10-10:30	3.9	4.4	3.5	1.7	X	"	2.7

PARKING LOT UTILIZATION BY HOUR, DAY, AND WEEK

South Campus, MCCC

Week of January 9-13, 1967

LOT # 3 CAPACITY = 612

PERCENT = Number of spaces in use expressed as a percent of all spaces available

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	WEEKLY	
TIME	PERCENT	PERCENT	PERCENT	PERCENT	PERCENT	CAPACITY	PERCENT
7-7:30	2.8	3.6	3.1	3.9	5.7	3060	3.8
8-8:30	26.5	15.3	18.5	13.6	15.7	"	17.9
9-9:30	30.2	21.7	38.4	24.7	19.3	"	26.9
10-10:30	32.7	26.8	33.3	26.8	23.5	"	28.6
11-11:30	32.2	25.0	35.4	17.1	19.8	"	25.9
12-12:30	31.7	27.3	32.8	24.8	19.9	"	27.3
1-1:30	28.1	22.7	24.7	16.5	16.0	"	21.6
2-2:30	23.2	20.1	24.7	17.8	13.7	"	19.9
3-3:30	20.9	15.5	20.4	17.0	5.9	"	15.9
4-4:30	6.4	3.4	5.7	4.1	1.3	"	4.2
5-5:30	5.1	2.4	1.9	2.4	X	"	2.4
6-6:30	4.4	6.2	4.4	5.5	X	"	4.1
7-7:30	3.9	7.7	4.4	6.4	X	"	4.5
8-8:30	3.1	5.5	2.9	4.7	X	"	3.3
9-9:30	1.6	2.8	1.1	1.3	X	"	1.4
10-10:30	.65	.32	.32	.16	X	"	.22

PARKING LOT UTILIZATION BY HOUR, DAY, AND WEEK

South Campus, MCCC

Week of January 9-13, 1967

LOT # 4 CAPACITY = 645

PERCENT = Number of spaces in use expressed as a percent of all spaces available

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	WEEKLY	
TIME	PERCENT	PERCENT	PERCENT	PERCENT	PERCENT	CAPACITY	PERCENT
7-7:30	16.3	7.9	7.6	9.4	7.3	3225	9.7
8-8:30	23.4	20.1	29.3	26.0	25.7	"	24.9
9-9:30	33.8	44.6	28.8	30.4	28.7	"	33.3
10-10:30	38.6	37.5	39.1	39.8	32.4	"	37.5
11-11:30	40.3	37.0	36.3	40.1	29.1	"	36.6
12-12:30	41.2	33.9	36.7	40.8	18.6	"	34.3
1-1:30	37.7	30.8	29.0	34.7	15.0	"	29.4
2-2:30	29.8	40.3	27.3	33.0	10.5	"	28.2
3-3:30	26.5	19.1	24.8	27.7	18.4	"	23.3
4-4:30	21.7	18.1	22.9	14.6	16.7	"	18.8
5-5:30	7.4	14.9	15.5	6.3	12.7	"	13.4
6-6:30	18.3	22.5	20.0	2.2	22.3	"	17.0
7-7:30	20.8	24.3	20.3	1.1	23.4	"	18.0
8-8:30	21.4	23.1	19.1	.31	21.5	"	17.1
9-9:30	12.2	13.5	10.4	.31	11.9	"	9.7
10-10:30	5.7	3.2	2.8	.15	1.5	"	2.7

PARKING LOT UTILIZATION BY HOUR, DAY, AND WEEK

South Campus, MCCC

Week of January 9-13, 1967

LOT # 5 CAPACITY = 544

PERCENT = Number of spaces in use expressed as a percent of all spaces available

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	WEEKLY	
TIME	PERCENT	PERCENT	PERCENT	PERCENT	PERCENT	CAPACITY	PERCENT
7-7:30	12.7	8.1	6.8	8.3	11.6	2720	9.5
8-8:30	18.6	16.2	16.9	18.7	18.0	"	17.7
9-9:30	30.9	30.9	33.4	27.6	31.8	"	30.9
10-10:30	36.0	33.3	34.2	29.8	33.3	"	33.3
11-11:30	34.4	35.3	57.3	25.4	23.9	"	35.3
12-12:30	32.9	31.6	49.3	23.3	20.9	"	31.6
1-1:30	34.2	26.6	26.3	21.5	24.8	"	26.7
2-2:30	25.4	20.2	20.0	17.1	18.9	"	20.3
3-3:30	24.1	14.0	15.4	11.9	14.0	"	15.9
4-4:30	20.2	10.7	17.6	12.7	7.9	"	13.8
5-5:30	17.5	15.6	11.6	3.9	9.2	"	11.5
6-6:30	17.8	20.8	16.9	.36	18.6	"	14.9
7-7:30	18.6	23.3	18.7	.18	20.4	"	16.2
8-8:30	19.1	22.6	16.2	X	18.9	"	15.4
9-9:30	9.4	10.5	9.0	X	11.2	"	8.0
10-10:30	4.2	3.7	2.9	X	.91	"	2.3

PARKING LOT UTILIZATION BY HOUR, DAY, AND WEEK

South Campus, MCCC

Week of March 6-10, 1967

LOT # 1 CAPACITY = 528

PERCENT = Number of spaces in use expressed as a percent of all spaces available

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	WEEKLY	
TIME	PERCENT	PERCENT	PERCENT	PERCENT	PERCENT	CAPACITY	PERCENT
7-7:30	60.0	56.3	65.2	60.2	61.6	2640	60.6
8-8:30	78.8	77.7	79.0	79.4	79.0	"	79.4
9-9:30	86.2	85.6	88.1	85.6	87.5	"	86.6
10-10:30	90.3	90.0	92.4	91.3	90.2	"	90.8
11-11:30	90.7	90.5	95.8	92.4	90.5	"	91.7
12-12:30	82.4	90.5	86.9	88.8	88.1	"	87.5
1-1:30	89.0	90.3	93.0	89.0	84.7	"	89.2
2-2:30	87.3	92.0	88.1	86.9	78.0	"	86.5
3-3:30	80.3	81.6	81.4	81.1	76.7	"	80.3
4-4:30	86.7	75.2	80.9	72.5	45.6	"	72.2
5-5:30	51.9	55.5	45.6	63.3	26.7	"	60.0
6-6:30	69.3	75.0	69.9	73.5	13.4	"	60.2
7-7:30	69.9	72.0	68.2	70.8	10.4	"	58.3
8-8:30	53.4	61.0	57.8	59.1	6.6	"	47.6
9-9:30	35.8	31.8	38.4	38.8	4.0	"	29.8
10-10:30	5.9	5.5	11.2	6.8	3.2	"	6.5

PARKING LOT UTILIZATION BY HOUR, DAY, AND WEEK

South Campus, MCCC

Week of March 6-10, 1967

LOT # 2 CAPACITY = 480

PERCENT = Number of spaces in use expressed as a percent of all spaces available

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	WEEKLY	
TIME	PERCENT	PERCENT	PERCENT	PERCENT	PERCENT	CAPACITY	PERCENT
7-7:30	32.9	24.6	34.0	27.1	32.7	2400	30.1
8-8:30	63.3	60.4	69.6	64.4	53.3	"	62.2
9-9:30	76.7	78.3	78.0	67.1	55.8	"	71.2
10-10:30	80.2	79.6	78.3	79.0	65.2	"	76.5
11-11:30	82.1	74.8	82.3	76.0	69.4	"	76.9
12-12:30	75.2	71.0	74.8	72.1	62.9	"	71.2
1-1:30	67.5	66.0	57.5	67.7	54.6	"	62.7
2-2:30	49.6	55.8	48.3	55.2	45.6	"	50.9
3-3:30	41.9	36.3	43.5	37.5	25.4	"	36.9
4-4:30	36.5	28.8	42.7	27.3	12.5	"	29.5
5-5:30	22.9	30.0	27.3	26.9	6.7	"	22.8
6-6:30	47.9	38.3	43.3	35.0	5.4	"	34.0
7-7:30	43.5	36.5	37.5	36.9	5.2	"	31.9
8-8:30	22.1	27.9	26.7	25.2	1.3	"	20.6
9-9:30	10.0	19.0	11.5	14.4	0.8	"	11.1
10-10:30	0.4	1.9	1.9	2.1	0.4	"	1.3

PARKING LOT UTILIZATION BY HOUR, DAY, AND WEEK

South Campus, MCCC

Week of March 6-10, 1967

LOT # 3 CAPACITY = 612

PERCENT = Number of spaces in use expressed as a percent of all spaces available

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	WEEKLY	
TIME	PERCENT	PERCENT	PERCENT	PERCENT	PERCENT	CAPACITY	PERCENT
7-7:30	6.7	3.9	7.0	4.9	6.9	3060	5.9
8-8:30	16.5	19.4	24.0	21.1	17.8	"	19.8
9-9:30	27.1	28.9	30.1	35.5	18.8	"	28.1
10-10:30	27.8	34.5	30.2	30.4	22.1	"	29.0
11-11:30	34.0	32.4	31.5	29.7	24.7	"	30.5
12-12:30	27.8	26.8	29.6	25.8	23.5	"	26.7
1-1:30	24.3	26.5	24.8	25.0	20.6	"	24.2
2-2:30	18.8	18.1	18.8	20.6	13.6	"	18.0
3-3:30	14.9	13.2	14.9	15.8	11.6	"	14.1
4-4:30	9.0	4.4	10.6	3.6	1.3	"	5.8
5-5:30	1.5	2.6	3.3	2.0	0.3	"	1.9
6-6:30	4.4	2.9	2.9	2.6	0.0	"	2.6
7-7:30	3.1	2.9	1.8	2.3	0.0	"	2.0
8-8:30	1.0	2.1	0.5	1.5	0.0	"	1.0
9-9:30	0.7	0.3	0.3	0.7	0.0	"	0.4
10-10:30	0.0	0.0	0.0	0.0	0.0	"	0.0

PARKING LOT UTILIZATION BY HOUR, DAY, AND WEEK

South Campus, MCCC

Week of March 6-10, 1967

LOT # 4 CAPACITY = 645

PERCENT = Number of spaces in use expressed as a percent of all spaces available

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	WEEKLY	
TIME	PERCENT	PERCENT	PERCENT	PERCENT	PERCENT	CAPACITY	PERCENT
7-7:30	17.4	20.6	16.1	21.6	16.6	3225	18.4
8-8:30	40.9	38.1	30.1	35.3	36.1	"	36.1
9-9:30	46.8	42.8	44.8	40.8	39.1	"	42.9
10-10:30	49.6	45.9	49.9	45.3	44.2	"	47.0
11-11:30	51.8	43.7	51.8	45.7	33.3	"	45.3
12-12:30	51.5	40.9	50.5	39.1	34.3	"	43.3
1-1:30	44.0	38.4	44.5	36.9	37.1	"	40.2
2-2:30	35.3	33.6	35.8	33.0	28.2	"	33.2
3-3:30	27.6	26.2	27.1	26.4	20.3	"	25.5
4-4:30	21.6	19.1	22.6	18.8	9.9	"	18.4
5-5:30	17.4	17.4	16.4	18.6	6.7	"	15.3
6-6:30	29.5	28.7	26.8	31.3	4.0	"	24.1
7-7:30	29.1	30.4	26.0	35.3	2.3	"	24.7
8-8:30	18.6	25.9	17.1	22.9	1.9	"	17.3
9-9:30	11.6	10.1	8.7	11.2	1.6	"	8.6
10-10:30	1.9	2.2	2.5	2.3	1.6	"	2.1

PARKING LOT UTILIZATION BY HOUR, DAY, AND WEEK

South Campus, MCCC

Week of March 6-10, 1967

LOT # 5 CAPACITY = 544

PERCENT = Number of spaces in use expressed as a percent of all spaces available

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	WEEKLY	
TIME	PERCENT	PERCENT	PERCENT	PERCENT	PERCENT	CAPACITY	PERCENT
7-7:30	14.9	14.9	12.9	18.6	13.6	2720	15.0
8-8:30	39.3	30.0	32.5	33.5	30.7	"	33.2
9-9:30	44.9	37.5	45.2	43.2	32.2	"	40.6
10-10:30	52.0	40.4	46.0	44.7	35.5	"	43.7
11-11:30	53.1	41.4	49.4	38.6	43.4	"	45.2
12-12:30	46.0	38.4	49.3	35.3	38.4	"	42.2
1-1:30	44.7	34.2	45.8	33.3	35.1	"	38.6
2-2:30	31.8	31.8	36.2	29.6	26.8	"	31.3
3-3:30	23.7	21.5	24.8	23.2	15.6	"	21.8
4-4:30	17.3	16.5	20.4	15.3	7.7	"	15.4
5-5:30	13.2	15.1	14.2	15.3	3.7	"	12.3
6-6:30	22.6	25.0	23.2	25.0	2.8	"	19.7
7-7:30	27.4	27.8	24.8	24.3	1.7	"	21.2
8-8:30	15.8	18.9	15.3	14.0	0.4	"	12.9
9-9:30	7.7	9.7	7.4	7.4	0.2	"	6.5
10-10:30	0.7	0.9	0.9	1.7	0.2	"	0.9

COMPARATIVE ANGULAR DESIGN LAYOUTS

The stall is the basic design unit in a parking lot. When planning the dimensions of the stall, the size of the automobile it is to accommodate and the wide opening doors of most modern automobiles must be considered.

Architectural Graphic Standards gives 8'0" as a minimum stall width. 8'6" is given as an average by such commercial construction firms as: National Garages, Automated Parking Devices, and Western Industries, Inc. The length of the stall varies somewhat depending upon whether the stalls are set at 90 degrees or in acute angular patterns. Stall lengths vary from 17'2" to 20'0". 18' or 19' appear to be the average and is based on the average length of the most widely used cars.

Aisle width is related to the parking angle and to the width of the stall. A 90 degree parking layout requires an aisle width of approximately 25'. Parking layouts employing angular designs (60^{o}, 45^{o}) permit a control of direction of traffic and require a narrower aisle width. Angle parking is easier to park and un-park since the turning radius is less.

Lot #1, which includes both staff and student portions, has been re-designed to display a change in the direction of parking modules from north-south to east-west at angles of 90^{o}, 60^{o}, and 45^{o}. See Appendices B, C, and D.

Appendix G illustrates that a reduction of our present stall size from 9' x 20' to 8'6" x 18' can conceivably increase the capacity of each lot, particularly if aisle widths are narrowed for one-way traffic control.

COMPARATIVE DATA FROM FIFTEEN TWO- AND FOUR-YEAR MICHIGAN INSTITUTIONS

For the purpose of the present study fifteen two-and four-year Michigan institutions of higher learning were selected as sources for parking utilization data for comparative analysis in order to determine possible norms. See Appendix H.

Attempts to formulate norms for parking requirements for similar institutions show that there are so many variables as to make it very difficult.

In several ways, institutions of higher learning resemble cities. The campus has parking areas, traffic controls, and a road network. And, like cities, traffic and pedestrian problems are complex. While planning for transportation, by most cities is an established procedure, systematic planning for institutions of higher learning is more complicated. Each situation requires a different approach or solution. Increased enrollments, more cars, and a proportionate increase in faculty and staff have created and compounded the parking and transportation problem for institutions of higher learning.

The numbers of comparable studies of parking lot utilization made in similar institutions available for the development of norms is too limited for satisfactory conclusions. Since the pattern of utilization of parking facilities is rather a fixed characteristic of individual institutions each institution employs standards aimed toward practical solutions.

A summary of information received by means of the questionnaire shows that: See appendix I

Winter 1966-67

1. Eleven respondents make use of parking permits and stickers.

   All seven community colleges reporting use a sticker system, however, no fees are charged.

   Oakland University began charging $2.00 for parking stickers this semester for its total campus population.

2. Fourteen respondents provide reserved parking spaces for transients and the disabled.

3. Seven respondents impose regular annual fees for parking. Fees range from $2.00 to $60.00 per year.

   No two-year institution reports charging fees.

4. Seven respondents reported a number of sq. ft. per stall. The average was 300.5 sq. ft. per stall. The range was 270 to 350 sq. ft. per stall.

5. Twelve respondents reported a ratio of users to stall. Range 1.6 to 6.2. Average was 3.9 users per stall. The average for two-year institutions reporting was 3.6 users per stall.

6. Thirteen respondents reported employing security controls or campus police.

SOUTH CAMPUS - MCCC - WINTER 1966-67

1. No permit or fee system in use.

2. Parking stickers are issued to faculty and staff only.

3. Visitors and disabled are provided parking spaces in Lot #1. Six additional spaces for visitors are provided in the reserved area at the flag pole.

4. Average 299.2 sq. ft. per stall at South Campus.

5. South Campus employs a security control of parking areas through campus police.

6. South Campus parking ratio is presently 2.5 users per stall.

PARKING STRUCTURES

In establishing a rationale for determining the feasibility for the erection and financing of a parking structure at MCCC, many variables must be given careful consideration.

The basic philosophy of the public community college precludes the charging of extra fees for services related to education. Broadly stated, the public community college's commitment is to provide education for its students at the least possible cost.

Above grade parking structures are expensive to build. Current costs range from $1500 to $2600 per car space. An estimated cost for MCCC is $1800 per car at 300 to 350 square feet per stall. A one thousand car facility would cost $1,800,000 including architects' fees and financing expenses. See Appendices J through M.

When comparing costs, according to Richard Dober in Campus Planning, and John Telfor, campus planner at the University of Michigan, if land is available at less than $150,000 per acre, it is more feasible to construct surface parking lots than it is to erect parking structures.

In observing the master plans of MCCC it is apparent that about one half of the total campus is allocated to parking lot areas and surface roads.

The consolodation of several parking lots into a single unit would result in lower labor and operating costs. Strategically placed parking structures would service a greater number of automobiles and free land presently in use as surface parking lots for building sites, green belt, etc. While parking structures are unheated they offer all-weather protection. An overhead enclosed ramp might connect the parking structure with campus buildings to provide increased pedes-

trian convenience and safety.

Present campus road patterns could be re-designed to eliminate congestion in both lateral and circulation traffic.

Perhaps one valid argument for the construction of a parking structure as a revenue facility is the assumption that society can be expected to subsidize student learning but hardly student transportation.

Plans to finance the construction of a parking facility would include an orderly liquidization of the investment through a continuous balanced operation:

1. Sale of revenue bonds and a pledging of income from the College bookstore and parking revenues. See Appendices K and L.
2. Possible budget allocations.
3. Possible Federal and State grants or loans.

Examples of funds needed annually to meet principle and interest payments for retirement of the bonds in the amount of $1.8 million are:

Term	Interest	For Retirement Principle and Interest per Year	
20 yrs.	4½%	$76.88/1,000	$138,384
30 yrs.	4½%	$61.39/1,000	$110,502
20 yrs.	4 %	$73.58/1,000	$132,444
30 yrs.	4 %	$57.83/1,000	$104,094

Maintenance costs including: personnel, surface repairs, snow removal, lighting, and security control would be decreased considerably.

CONCLUSIONS

1. A comparison of utilization data for the periods January 9-13 and March 6-10, indicates that Lots #1 - #5 are adequate for present parking demands and will continue to be adequate for projected enrollment increases during 1967.

   However, problems do exist in the utilization of Lot #1, and recommendations have been made to alleviate that situation.

2. Lot #1 (faculty and staff portion) -- The anticipated increase in faculty and staff numbers can be accommodated in the early morning until about 9:30 a.m., since the range of unused capacity is from 27 to 40%. Beginning with the late morning and continuing throughout the afternoon, the faculty and staff problem becomes acute. During these periods, the unused capacity is between 15 and 27%. In the evening, there is 30% or more of unused capacity.

3. Lot #1 (student portion) -- During the morning and afternoon periods, there is not sufficient capacity to provide for increased enrollments. Unused capacities range from 11 to 15% at these times.

4. Lot #1 (student portion) -- In the evening, Lot #1 will provide adequate capacity for increased enrollments since 30% or more of the stalls are unused.

5. Lot #2 -- During the morning and afternoon periods, increased enrollments offer no problem since the range of unused capacity is 23 to 43%. In the evening, there is 27% or more of unused capacity.

6. Lots #3, #4, and #5 -- During the entire day, there is 70% or more of unused capacity.

7. While slight increases in utilization have been noted during March 6-10, as compared with January 9-13, there appears to be no appreciable difference which would require major changes in the present system. See Appendices P and Q.

8. Lots #1 and #2 are heavily utilized because of their proximity to the campus buildings and also because of their relatively convenient entrances and exits on Twelve Mile Road.

9. Lot #3 is utilized least because of its poor surface condition and difficult access via Bunert Road, which is chronically in poor condition. Lot #3 is more distant from present campus buildings than Lots #1 and #2; however, it is closer than Lots #4 and #5.

10. Lots #4 and #5 are under-utilized because they are most distant from present campus buildings.

11. The lack of an adequate feeder or ring road system for connecting all lots results in periodic congestion of traffic, especially during peak demand periods, inclement weather, and registration periods.

12. A re-designing of present stall layouts to a 60 instead of a 90 degree pattern can conceivably result in increased efficiency, greater safety and convenience for the driver, an elimination of the search pattern through a one-way system. and the addition of parking spaces.

13. The completion of the Industrial Technology Complex in February, 1968, will project a new demand for parking in the south area of the campus. Lots #10 and #11, which are immediately south of the new complex, are presently bisected by a service road north and south.

RECOMMENDATIONS

It is recommended that:

1. The surfaces of Lots #2 and #3 be improved by blacktopping.

2. Bunert Road be permanently improved, at least to the southwest corner of Lot #3, to provide for increased utilization safety, and convenience at entrances and exits from Lots #1, #2, and #3.

3. Lot #1 (faculty and staff portion) be extended to include one parking module of adjacent student portion. See Appendix O.

4. A new entrance/exit drive be constructed at the northwest corner of Lot #2.

5. The east/west perimeter road adjacent to Twelve Mile Road be changed to one-way control with traffic flow west and exiting on Bunert Road.

6. Asphalt speed bumps be placed at strategic locations on the surface of drives near the entrance to Building "C".

7. Entrances and exits be clearly identified with signs, directional arrows, both surface and eye-level types be provided; stall lines be double lines extending three-fourths of the length of the stall and joined together on the aisle side.

8. Consideration be given to suggestions for the conversion of the student portion of Lot #1 and also Lot #2 to pay lots in order to encourage greater utilization of Lots #3, #4, and #5, which shall remain free of charge.

9. Further study be made to determine traffic circulation patterns on the South Campus. Based on the finding of such a study, that a feeder or ring road pattern connectint all lots be devised in order to move traffic away from lots #1 and #2 to other lots.

10. Existing lots be re-designed to employ 60 degree angular layouts to eliminate present search patterns through a one-way traffic control.

11. The direction of parking lines be changed from north/south to east/west in order to feed pedestrians to the generation point via drive aisles.

12. A parking consultant firm be retained to review and analyze parking lot utilization and current problems at the South Campus and report on same.

13. Further study be undertaken to determine a rationale for the building and finance of a self-liquidating parking structure.

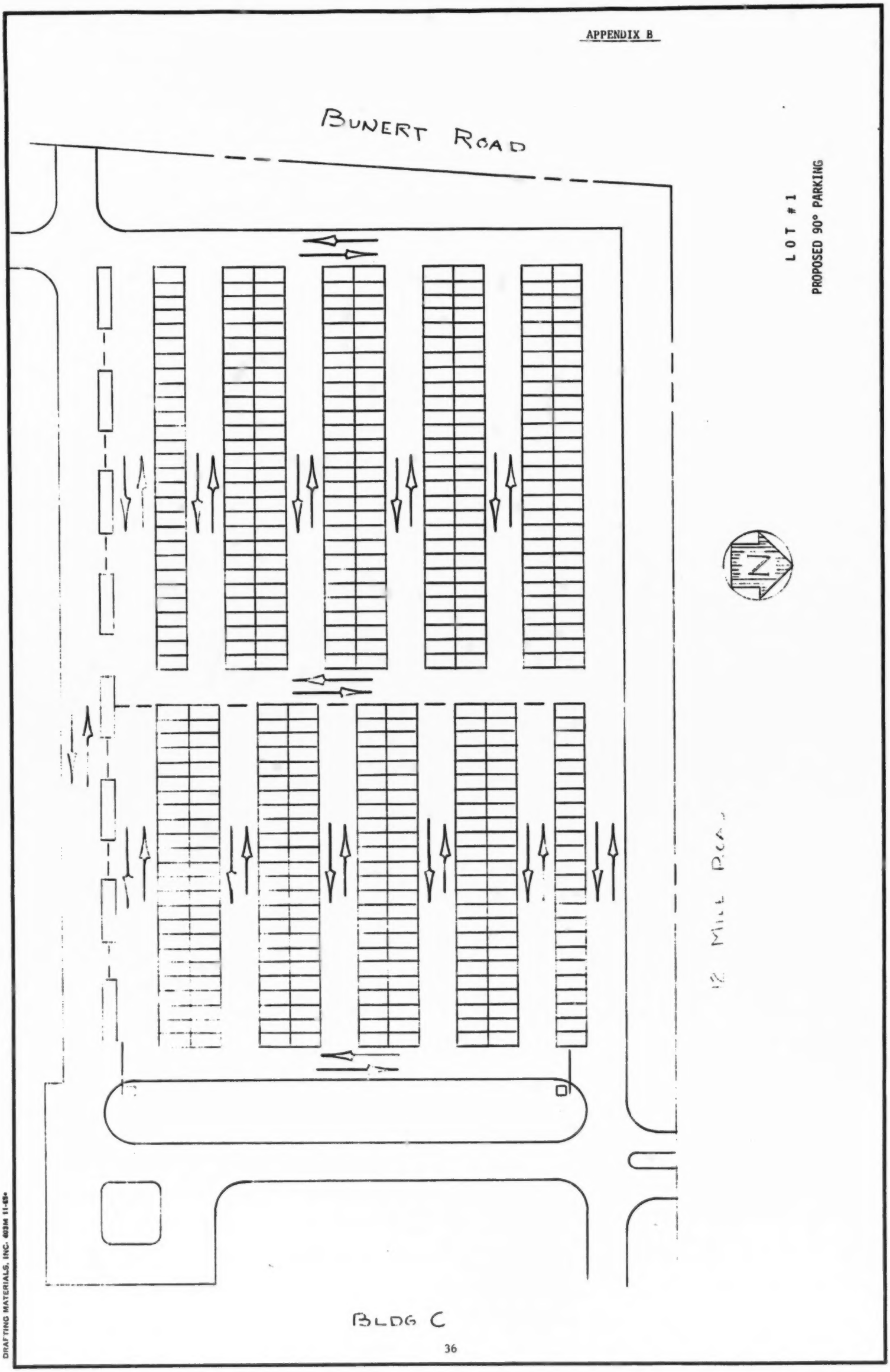
APPENDIX A

MCCC PARKING TABULATION SHEET

LOT NUMBER _____ DATE _____ CAPACITY _____

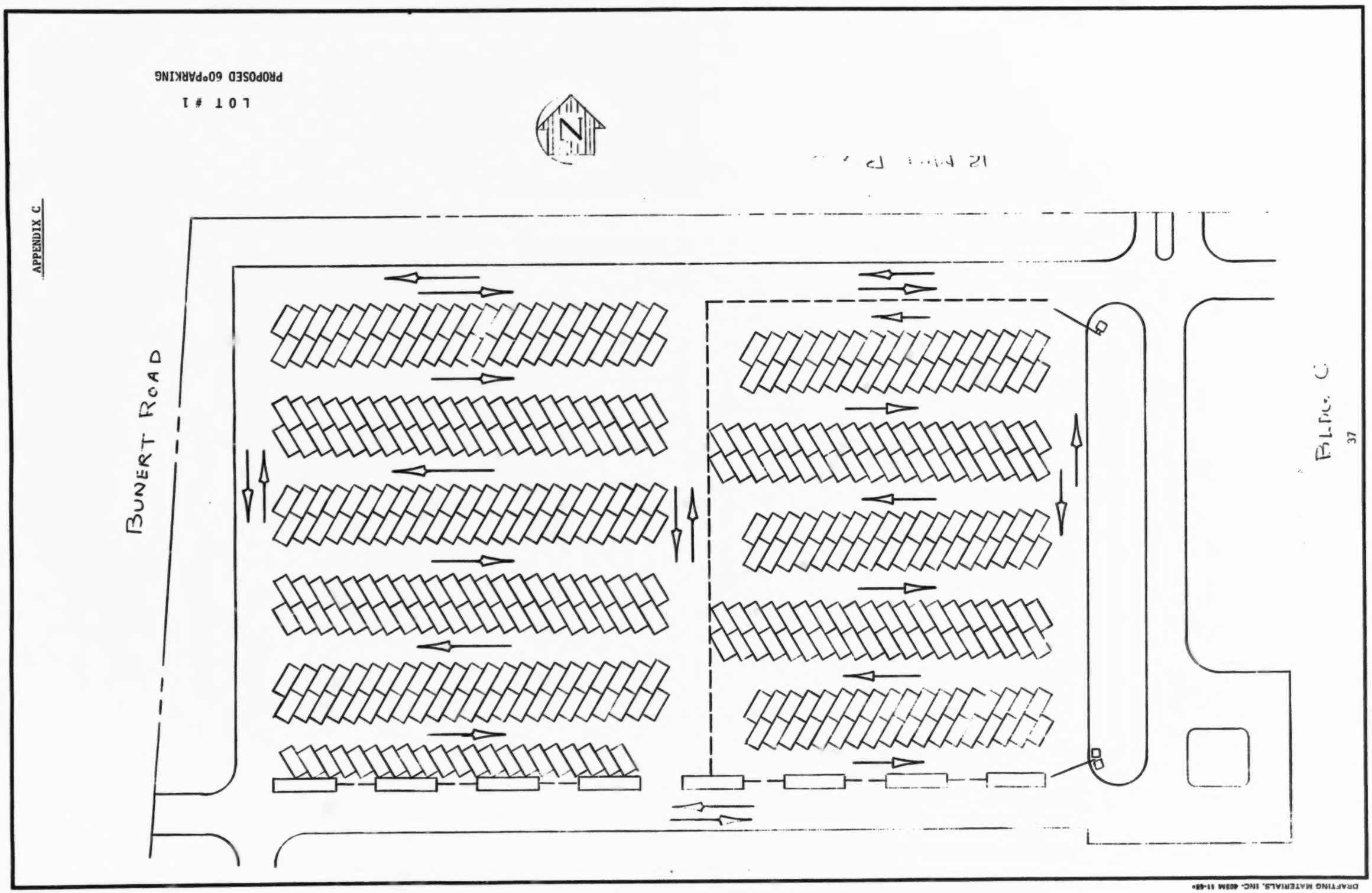
TIME	M	T	W	R	F	S	
7-7:30							
7:30-8							
8-8:30							
8:30-9							
9-9:30							
9:30-10							
10-10:30							
10:30-11							
11-11:30							
11:30-12							
12-12:30							
12:30-1							
1-1:30							
1:30-2							
2-2:30							
2:30-3							
3-3:30							
3:30-4							
4-4:30							
4:30-5							
5-5:30							
5:30-6							
6-6:30							
6:30-7							
7-7:30							
7:30-8							
8-8:30							
8:30-9							
9-9:30							
9:30-10							
10-10:30							
10:30-11							

APPENDIX B



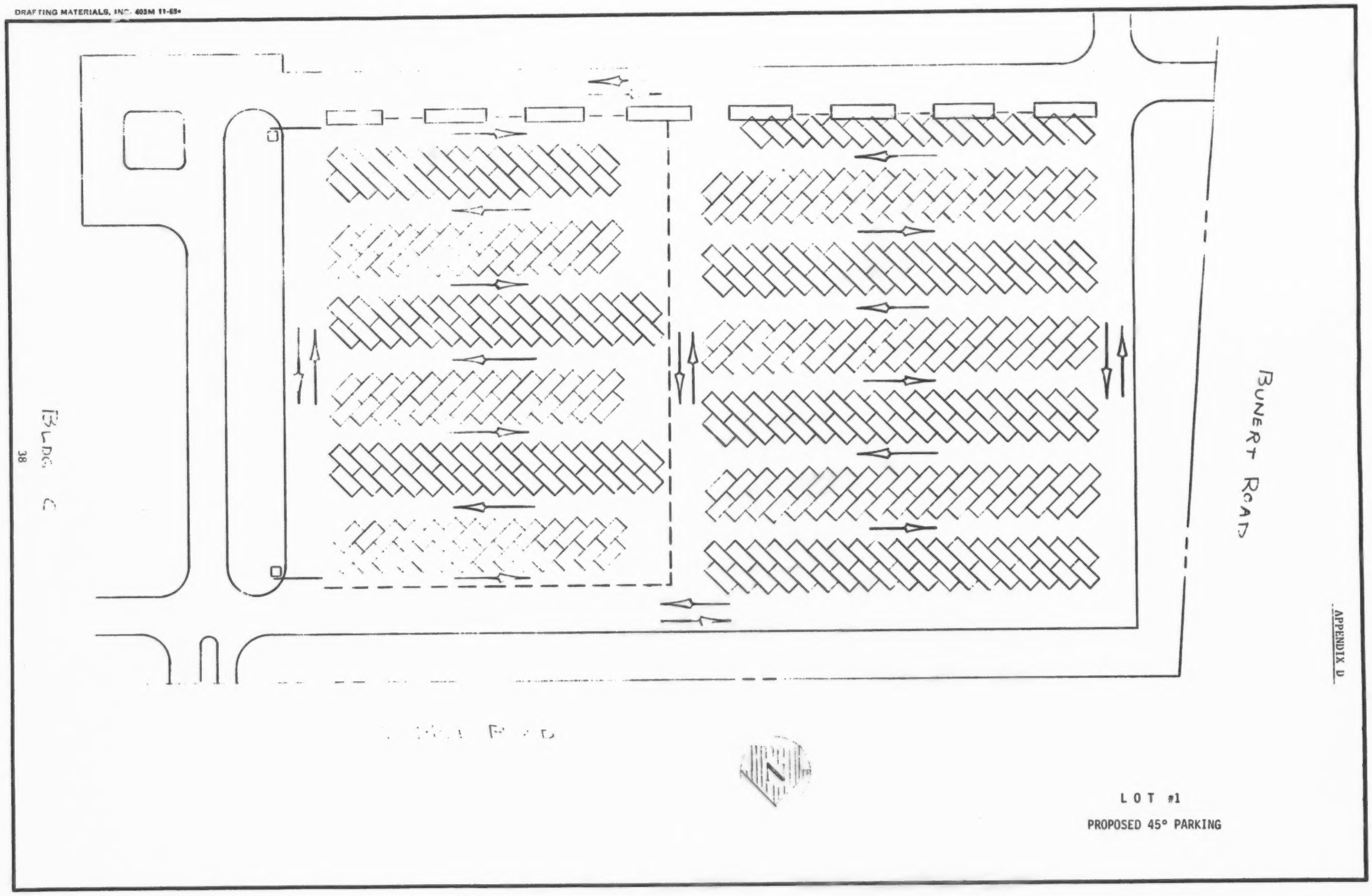
DRAFTING MATERIALS, INC. 603M 11-83

APPENDIX C



DRAFTING MATERIALS, INC. 4034 11-68

DRAFTING MATERIALS, INC. 403M 11-69•



APPENDIX D

LOT #1

PROPOSED 45° PARKING

APPENDIX E

AVERAGE PERCENTAGE OF PARKING STALLS USED PER DAY
BASED ON TIME PERIOD 7:30 am to 10:30 pm

Week of January 9-13, 1967

South Campus, MCCC

One entire day

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
LOT 1 STAFF	54.8	58.9	59.1	54.5	46.2
LOT 1 STUDENT	78.3	78.1	80.0	78.1	55.8
LOT 2 STUDENT	50.8	43.0	48.4	39.9	27.0
LOT 3 STUDENT	15.8	12.9	15.8	11.7	8.8
LOT 4 STUDENT	30.0	29.0	27.4	22.8	21.9
LOT 5 STUDENT	22.2	20.2	22.0	12.6	17.8

Morning period only (7:30-11:30)

DAY	LOT 1 STAFF	LOT 1 STUDENT	LOT 2 STUDENT	LOT 3 STUDENT	LOT 4 STUDENT	LOT 5 STUDENT
MONDAY	59.3	88.0	63.2	24.9	30.5	26.5
TUESDAY	66.4	84.6	51.8	25.0	29.5	24.8
WEDNESDAY	73.2	87.0	59.5	31.3	28.1	29.8
THURSDAY	60.6	85.7	41.50	17.24	30.8	22.0
FRIDAY	67.0	77.9	37.3	11.4	15.8	23.7

Afternoon period only (11:30-4:30)

DAY	LOT 1 STAFF	LOT 1 STUDENT	LOT 2 STUDENT	LOT 3 STUDENT	LOT 4 STUDENT	LOT 5 STUDENT
MONDAY	76.6	79.7	59.3	22.1	31.4	27.4
TUESDAY	84.5	84.3	48.9	17.8	28.5	18.5
WEDNESDAY	82.3	88.6	59.1	16.7	28.1	24.3
THURSDAY	78.9	82.7	41.5	16.0	30.8	17.3
FRIDAY	72.9	76.1	37.3	11.4	15.8	17.3

Evening period only (4:30-10:30)

DAY	LOT 1 STAFF	LOT 1 STUDENT	LOT 2 STUDENT	LOT 3 STUDENT	LOT 4 STUDENT	LOT 5 STUDENT
MONDAY	33.0	68.2	33.4	3.1	16.0	14.4
TUESDAY	31.2	67.5	30.8	4.2	16.9	16.7
WEDNESDAY	28.2	67.0	30.3	2.5	14.7	12.6
THURSDAY	29.2	68.0	29.9	4.8	1.8	.8
FRIDAY	6.8	15.6	1.83	0.0	15.6	13.2

AVERAGE PERCENTAGE OF PARKING STALLS USED PER DAY
BASED ON TIME PERIOD 7:30 am to 10:30 pm

Week of March 6-10, 1967

South Campus, MCCC

One entire day

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
LOT 1 STAFF	57.6	57.7	59.1	57.2	46.3
LOT 1 STUDENT	80.1	81.3	81.4	80.7	57.4
LOT 2 STUDENT	47.0	45.5	47.3	44.6	31.0
LOT 3 STUDENT	13.6	13.6	14.3	13.8	10.0
LOT 4 STUDENT	30.9	29.0	29.4	29.0	19.8
LOT 5 STUDENT	28.6	25.2	28.0	25.1	18.0

Morning period only (7:30-11:30)

DAY	LOT 1 STAFF	LOT 1 STUDENT	LOT 2 STUDENT	LOT 3 STUDENT	LOT 4 STUDENT	LOT 5 STUDENT
MONDAY	66.4	91.1	67.0	22.4	41.3	40.8
TUESDAY	65.5	89.7	63.5	23.8	38.2	32.8
WEDNESDAY	70.1	93.1	68.4	24.5	38.5	37.2
THURSDAY	70.3	89.3	62.7	24.3	37.7	35.7
FRIDAY	69.8	90.3	55.2	18.0	33.8	31.0

Afternoon period only (11:30-4:30)

DAY	LOT 1 STAFF	LOT #1 STUDENT	LOT 2 STUDENT	LOT 3 STUDENT	LOT 4 STUDENT	LOT 5 STUDENT
MONDAY	81.0	87.9	54.1	18.9	36.0	33.3
TUESDAY	80.5	89.5	51.5	17.8	31.6	28.4
WEDNESDAY	85.3	86.5	53.3	19.7	36.1	35.3
THURSDAY	79.8	86.6	51.9	18.1	30.8	27.3
FRIDAY	71.6	76.6	40.2	14.1	25.9	24.7

Evening period only (4:30-10:30)

DAY	LOT 1 STAFF	LOT 1 STUDENT	LOT 2 STUDENT	LOT 3 STUDENT	LOT 4 STUDENT	LOT 5 STUDENT
MONDAY	57.6	64.4	24.4	17.8	18.0	14.5
TUESDAY	57.7	67.5	25.6	18.0	19.1	16.2
WEDNESDAY	59.1	67.4	24.7	14.6	16.2	14.3
THURSDAY	57.2	68.5	23.4	13.1	20.2	14.6
FRIDAY	46.3	13.9	3.3	.05	3.0	1.5

CORRELATION OF PEAK PERIODS OF ROOM AND PARKING UTILIZATION
WEEK OF JANUARY 9-13, 1967 -- MACOMB COUNTY COMMUNITY COLLEGE

LOT		MONDAY		TUESDAY		WEDNESDAY		THURSDAY		FRIDAY	
		PEAK PARKING PERIODS	PEAK ROOM PERIODS	PEAK PARKING PERIODS	PEAK ROOM PERIODS	PEAK PARKING PERIODS	PEAK ROOM PERIODS	PEAK PARKING PERIODS	PEAK ROOM PERIODS	PEAK PARKING PERIODS	PEAK ROOM PERIODS
1	A	8:30 to	8:30 to	8:30 to	9:00 to	9:30 to	10:00 to	8:30 to	9:00 to	9:30 to	8:00 to
	M	2:30	2:00	2:30	3:00	2:30	3:00	1:30	2:00	2:30	1:00
	P	4:30 to	6:00 to	6:30 to	6:30 to	6:30 to	6:00 to	6:30 to	6:30 to	X	X
	M	8:30	7:30	8:30	9:00	7:30	9:00	8:30	9:00	X	X
2	A	9:30 to	8:30 to	9:30 to	9:00 to	9:30 to	10:00 to	9:30 to	9:00 to	9:30 to	8:00 to
	M	1:30	2:00	12:30	3:00	10:30	3:00	12:30	2:00	11:30	1:00
	P	6:30 to	6:00 to	6:30 to	6:30 to	6:30 to	6:00 to	6:30 to	6:30 to	X	X
	M	7:30	7:30	7:30	9:00	7:30	9:00	7:30	9:00	X	X
3	A	8:30 to	8:30 to	10:30 to	9:00 to	9:30 to	10:00 to	9:30 to	9:00 to	9:30 to	8:00 to
	M	12:30	2:00	12:30	3:00	12:30	3:00	12:30	2:00	12:30	1:00
	P	X	6:00 to	X	6:30 to	X	6:00 to	X	6:30 to	X	X
	M	X	7:30	X	9:00	X	9:00	X	9:00	X	X
4	A	9:30 to	8:30 to	9:30 to	9:00 to	10:30 to	10:00 to	10:30 to	9:00 to	9:30 to	8:00 to
	M	2:30	2:00	2:30	3:00	12:30	3:00	1:30	2:00	12:30	1:00
	P	X	6:00 to	X	6:30 to	X	6:00 to	X	6:30 to	X	X
	M	X	7:30	X	9:00	X	9:00	X	9:00	X	X
5	A	9:30 to	8:30 to	9:30 to	9:00 to	10:30 to	10:00 to	9:30 to	9:00 to	9:30 to	8:00 to
	M	12:30	2:00	12:30	3:00	1:30	3:00	11:30	2:00	10:30	1:00
	P	X	6:00 to	X	6:30 to	X	6:00 to	X	6:30 to	X	X
	M	X	7:30	X	9:00	X	9:00	X	9:00	X	X

DIMENSIONS FOR PARKING ANGLES WITH VARYING STALL SIZES*

α Parking Angle	W & L Width and Length of Stall	N Number of Car Stalls Per Unit Length of Parking Line (PL)	N_{100} Number of Car Stalls per 100 Linear Feet of Parking Length
90°	8'6" x 18'	$n=\frac{PL}{8'6"}$	11.7
	9' x 18'	$n=\frac{PL}{9'0"}$	11.1
	**9' x 20'	$n=\frac{PL}{9'0"}$	11.1
60°	8'6" x 18'	$n=\frac{PL-6'6"}{9'10"}$	9.5
	9' x 18'	$n=\frac{PL-6'4"}{10'5"}$	9.0
	**9' x 20'	$n=\frac{PL-7'5"}{10'5"}$	8.9
45°	8'6" x 18'	$n=\frac{PL-6'9"}{12'0"}$	7.8
	9' x 18'	$n=\frac{PL-6'4"}{12'9"}$	7.3
	**9' x 20'	$n=\frac{PL-7'9"}{12'9"}$	7.25
30°	8' x 6" x 18'	$n=\frac{PL-2'10"}{17'0"}$	5.7
	9' x 18'	$n=\frac{PL-2'1"}{18'0"}$	5.4
	**9' x 20'	$n=\frac{PL-3'10"}{18'0"}$	5.3

*Derived from ENO Foundation formula 1960:

$$\frac{PL-[W \sin \alpha + L \cos \alpha - l]}{l}$$

** Dimensions of stalls at MCCC

l = Curb length of car

F A L L 1 9 6 6 - C O M P A R A T I V E D A T A

Institution	Headcount*	Fac&Staff	Total Num. Stalls	Permit Fee	Parking Sticker	Transient Disabled	Total Area Sq. Ft.	Sq. Ft. Per Stall	Security Control	User Per Stall Ratio
Macomb Cty. Com. Coll.	9,956 **9,707	742	2,809	No	No	Yes	Yes	840,456	299.2	Yes	2.5
Central Mich. Un.	9,411	1,260	2,503	Yes	Yes	Yes	Yes	925,665	N.A.	Yes	4.3
Detroit Inst. Tech.	2,025 **2,100	115	N.A.	No	Yes	No	No	N.A.	N.A.	No	N.A.
Eastern Mich. Un.	12,887 **12,897	1,200	2,500	Yes	Yes	Yes	Yes	898,080	300.	Yes	5.6
Flint Com. Jun. Coll.	6,230 **8,632	432	1,793	No	No	Yes	Yes	N.A.	N.A.	Yes	5.1
Henry Ford Com. Coll.	10,886 **11,027	625	2,519	F/S	No	F/S	Yes	23.75 acres	N.A.	Yes	4.6
Highland Pk. Com. Coll.	3,312 **3,343	244	F/S208	F/S	No	F/S	No	54,000	N.A.	Yes	F/S 1.2
Lansing Com. Coll.	3,732	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Lawrence Inst. Tech.	3,885	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Mich.State University	39,887 **38,107	6,854	16,900	Yes	Yes	Yes	Yes	4,658,000	275.6	Yes	2.7
Oakland Com. Coll.	4,100	N.A.	N.A.	Yes	No	Yes	Yes	N.A.	N.A.	N.A.	N.A.
Oakland University	3,143 **2,975	523	2,223	Yes	Yes $2	Yes	Dis. 5 Trans.62	500,000	270.	Yes	1.6
School-craft Coll.	3,188 **3,724	180	1,399	Yes	No	Yes	Yes 40	530,480	N.A.	Yes	2.8
Univ. of Detroit	8,626 **8,626	750	2,480	No	No	Yes	Yes	580,320	279.	Yes	3.8
Univ. of Michigan	33,062 **34,453	9,781	9,772	Yes	$25 /yr	Yes	Yes	1,408,328	350.	Yes	4.5
Wayne State Un.	30,832	4,385	5,654	$60 /yr	Yes	No	Yes	1,868,986	330.	Yes	6.2
Western Mich. Un.	16,470 **16,400	1,246	5,411	Yes	Yes	Yes	Yes	N.A.	N.A.	Yes	3.3

* Michigan Association of Collegiate Registrars and Admissions Officers

** Actual Count

MACOMB COUNTY COMMUNITY COLLEGE

December 16, 1966

Campus Planner,

Dear Sir:

Macomb County Community College is undertaking a utilization study of its parking lots. The results of the study will have implications for construction of parking facilities on its new campus which will admit students in September, 1968.

We are interested in collecting comparable information from several two- and four-year institutions in Michigan.

May we request the following information from your institution, if available:

1. Headcount
2. Number of full- and part-time faculty and staff
3. Total number of parking spaces in surface lots and in structures
4. Is a parking permit system used?
5. Is a fee charged?
6. Are car stickers used?
7. Are spaces provided for transients and the disabled?
8. Total square feet area of parking facilities
9. Square feet per parking space
10. Security controls

Your response will be greatly appreciated.

If you wish a copy of the completed survey, we will be happy to forward it to you.

Respectfully yours,

Charles A. Braun
Research Assistant

Submitted to Macomb County Community College
December 28, 1966 - by T. W. Zoedes, Architect

APPENDIX J

ECONOMIC STUDY FOR THE CONSTRUCTION OF A PARKING FACILITY FOR MACOMB COUNTY COMMUNITY COLLEGE

One of the biggest problems of businesses and institutions today is the acquisition of land in the most desirable location. Since most of the desirable areas are developed, one must pay a high price, or, as in the case of a government project, must condemn and then purchase the property at a considerable value.

This does not always work out nicely, and acquisition sometimes becomes an unpleasant thing. So today, making the most of the property at hand is highly important.

In the case of parking, a parking facility would help to make the best use of the land at hand. A parking facility will provide parking six to eight times as great as will parking at grade level.

In the case of the Macomb Community College, lots 6,7,8,9,10 and 11 are proposed for future parking lots. These lots roughly represent half of the college campus, with no other use but to provide space for parking, which is a necessary function. By utilizing several parking ramps, all the parking considered at grade level can be provided on Lot. No. 6, freeing the other five parking lots for future expansion of academic facilities. Consideration at this time might also be given to a scheme whereby part of the ramp might be used for classrooms, storage, maintenance, or even in conjunction with a facility such as a stadium or an auditorium.

The cost of constructing a parking facility is much less than most types of construction. Current figures show that a cost of $ 1,500.00 to $ 2,600.00 per parking space for open or above grade construction and about $ 3,000.00 to $ 3,500.00 per parking space for construction below grade is the current price for a parking facility. Breaking this down even further, into per square foot figures, we find that it takes $5.00 to $5.50 per square foot above ground and $8.00 to $10.00 below grade. A parking space, including maneuvering area, requires approximately 350 square feet. Therefore, considering a six hundred car parking deck, it would cost, using a mean figure of $1800.00 per per space, a total of $1,080,000.00. From national surveys taken by the parking industry, it is known that one space should be provided for every 1.5 students. Therefore, a six hundred car parking deck can accomodate approximately nine hundred students. This cost may seem large, and it is, but consideration should be made as to the savings on now available property presently owned, as compared to purchasing new land. Also, the cost of

black top paving, shrubs, grass, and lights that must be provided with parking at grade level can be greatly reduced by incorporating them into a parking facility. Along with the savings, a parking facility also has means of supporting itself.

As an example, let us consider a six hundred car parking facility or deck, which is about the average size of your lots. Let us also consider a turnover of two spaces used per day. This is a realistic figure, at twenty five cents per space. Considering a 200 day school year, the return would be $ .25 x 2 x 600 = $300.00 for one day, and 200 x $300.00 = $60,000.00 per year. This is the earning power of a parking facility charging $ .25 per space to park.

Now, not considering any other expenses such as maintenance, interest, etc., the facility would pay for itself in eighteen years: 18 x $60,000.00 = $1,080,000.00. If financing is for twenty years, the additional 2 years would realize 2 x $60,000.00 = $120,000.00 over and above the actual cost of the facility and at 25 years, seven years beyond eighteen, it would be 7 x $60,000.00, or $420,000.00 over and above the cost of construction. The last time that I checked, financing was available, and as far as I know, it still is.

There are expenses in the operation of a parking deck, such as wages, insurance, etc. A breakdown of possible expenses follows:

1. Wages
    a. Ticket Teller - could be eliminated by using a gate that operates upon deposit of a coin.
    b. Maintenance - you already have.
2. Payroll Tax.
3. Insurance.
4. Heat.
    a. Elevator lobbies.
    b. Manager's office.
5. Light and Power.
6. Maintenance.
    a. Paint.
    b. Small Repairs.
7. Telephone.
8. Office Supplies.
9. Depreciation of equipment.

SELF - LIQUIDATING REVENUE TABLE

As a general rule, parking lots anticipate two turnovers per day.

No. of Cars	Rate Per Car	Daily	Monthly	Yearly*
1,000	$ 0.10	$ 200.	$ 3,000.	$ 36,000.
1,000	0.15	300.	4,500.	54,000.
1,000	0.20	400.	6,000.	72,000.
1,000	0.25	500.	7,500.	90,000.
1,000	0.50	1,000.	15,000.	180,000.

* The above figures are based on 180 days/year at 15 days/month not including the 8 week summer school session

PARKING REVENUES - INCOME PROJECTIONS

A suggested additional registration fee of $1.00 per credit hour might be charged to the student at each semester beginning ($15 maximum).

Cars would be registered each semester and parking permits would be issued (stickers).

Macomb County Community College Adademic Schedule

Two 18-week semesters per year plus an 8-week summer session.

18 x 2 = 36 ÷ 4 = 9 months.

Based on a 15-day month 9 x 15 = 135 days

Fall Semester 1966-67 TOTAL HEADCOUNT

(headcount)	9,707	= 6,401	(FTE Students)
(hours carried)	87,928	57,981*	(Derived FTE hours)

The following information was based on the assumption that 64.2% of the total college headcount 9,707 is 6,231 which represents the headcount on the South Campus only.

64.2% of 9,707 = 6,231 on-campus headcount

64.2% of 6,401 FTE Students = 4,109 FTE Students on-campus

4,109 FTE Students x 15 hours = 61,635 x 2 semesters = $123,270

This estimate excludes the summer session and the fact that enrollments have since increased making this a conservative estimate.

PARKING STRUCTURES COST AND AREA ANALYSES

	CHURCH ST. ACTUAL	CATHERINE ST. ACTUAL	THAYER ST. ACTUAL	THOMPSON ST. ACTUAL	EAST MEDICAL ACTUAL	WASHINGTON ST. ACTUAL
I. AREA COMPARISONS						
1. Capacity No. of Cars	469	411	443	758	1,045	945
2. Gross Floor Area	166,485	135,527	165,241	234,695	323,880	382,500
3. Gross Floor Area/Car	355	330	373	309	310	405
4. Total Stall Area	78,759	67,420	74,286	116,511	182,622	155,000
5. Stall Area/Car	167.93	164.04	167.69	153.0	174.5	164.0
6. Percentage Area of Stalls	47.4%	49.7%	45%	49.6%	56.38%	40.5%
7. Total Drive & Ramp Area	74,228	50,643	70,171	99,480	126,626	209,100
8. Drive & Ramp Area/Car	158.27	123.22	158.4	131.24	121.0	222.0
9. Percentage of Area in Ramps	44.7%	37.4%	42.3%	42.4%	39.09%	54.7%
10. Total Utility Area	3,503	3,880	6,498	8,872	7,992	9,200
11. Utility Area/Car (Stairs, Elevator, etc.)	7.47	9.44	14.67	11.7	7.64	9.75
12. Percentage Area of Utility	2.1%	2.86%	3.72%	3.8%	2.5%	2.4%
13. Total Structural Space	9,924	13,871	15,486	9,832	6,640	9,200
14. Structural Space/Car (Walls, Columns, etc.)	21.16	33.75	32.7	13.0	6.35	9.75
15. Percentage Area of Structural	5.95%	10.2%	9.15%	4.2%	2.05%	2.4%
II. VOLUME COMPARISON						
1. Gross Volume in Cu. Ft.	1,365,454	1,125,355	1,348,062	1,858,514	2,982,200	3,032,000
2. Cubic Foot/Car	2,912	2,738	3,043	2,454	2,860	3,210
III. COST COMPARISONS						
1. Total Architect's Fees	29,565.89	29,308.18	39,822.14	47,000.00	112,070.00	124,250.00
2. Architect's Fees/Sq. Ft.	.178	.216	.241	.20	.112	.325
3. Architect's Fees/Car	63.00	71.40	89.75	62.00	107.30	131.60
4. Total Construction Cost	593,516.41	529,371.79	*807,176.30	*954,955	*2,241,395.00	**2,485,000.00
5. Construction Cost/Sq. Ft.	3.56	3.91	*4.89	*4.07	*6.95	**6.50
6. Construction Cost/Cu. Ft.	.434	.47	*.60	*.51	*.752	**.821
7. Construction Cost/Car	1,266.49	1,288.00	*1,820.00	*1,259.84	*2,122.00	**2,640.00
8. Total Project Cost	625,956.38	571,240.05	*856,052.23	*1,008,115.19	*2,380,000.00	**3,124,000.00
9. Project Cost per Sq. Ft.	3.76	4.22	*5.18	*4.29	*7.38	**8.16
10. Project Cost per Cu. Ft.	.459	.507	*.625	*.505	*.797	**1.03
11. Project Cost per Car	1,324.50	1,389.00	*1,930.00	*1,330.00	*2,280.00	**3,320.00
DATE BIDS RECEIVED	May 8,1956	Jul 10,1958	Mar 2,1961	Feb 13,1962	Oct 5,1965	Jan 13,1966

* Includes cost of deck coating

** Includes cost of deck coating est. $120,000
and excludes cost of plaza est. $276,000

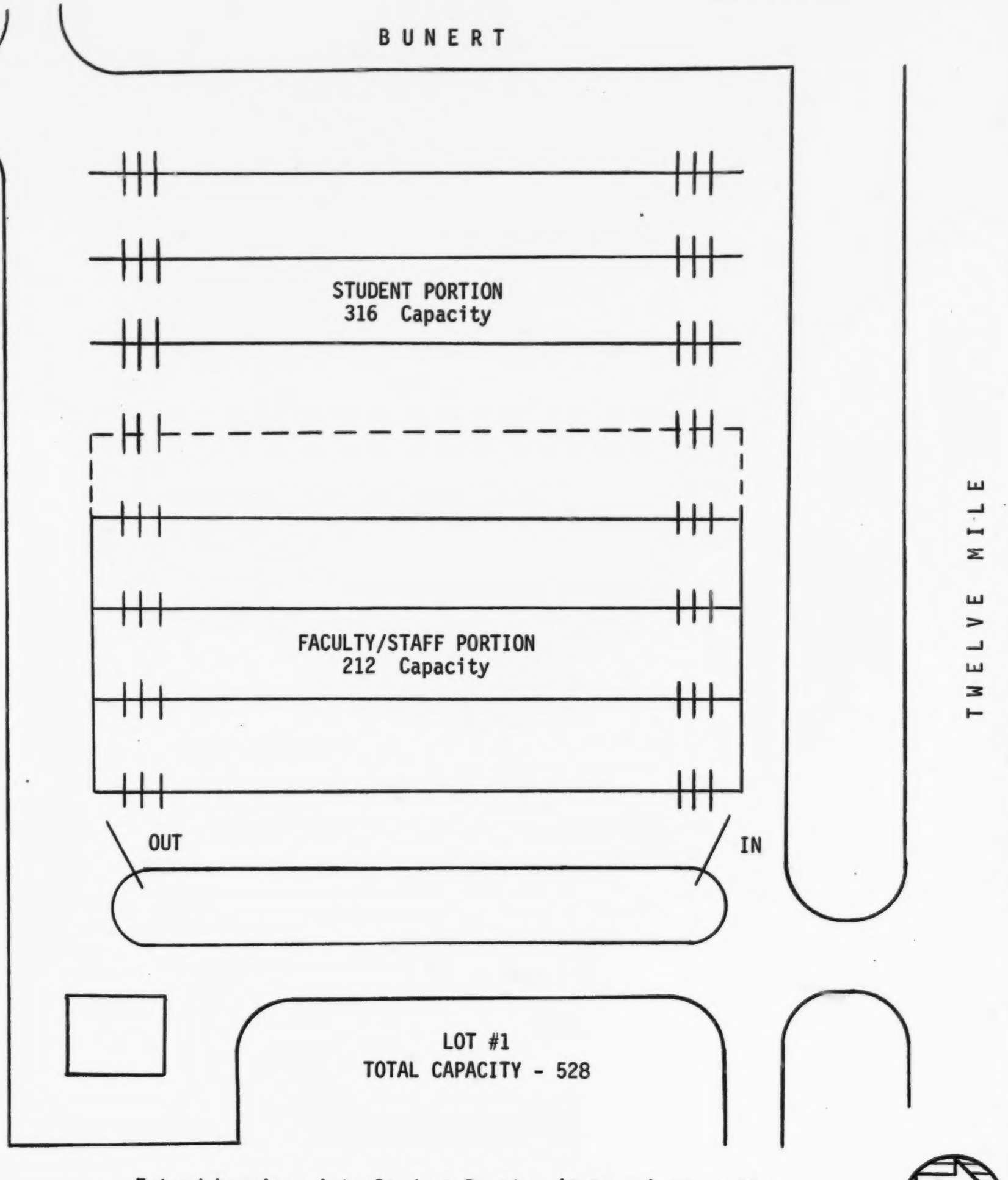
University Architect's Office
WEP/ld
Revised 2/1/66

O'Dell, Hewlett, & Luckenbach, Inc.
Architects · Engineers · Planners
950 North Hunter Boulevard
Birmingham, Michigan

COMPARATIVE ANALYSIS OF PARKING STRUCTURES

June 1, 1966

STRUCTURE	DATE	NO. CARS	NO. DECKS	SAREA SQ. FT.	CONSTR'N COST	AREA PER CAR	COST PER CAR	COST PER S.F.
Church Street The Univ. of Mich Ann Arbor, Mich.	1955	469	4	166,485	$ 588,760.00	354.98	$1,255.35	$3.54
Catherine Street The Univ. of Mich. Ann Arbor, Mich.	1957	411	5½	138,972	$ 530,467.00	338.13	$1,290.67	$3.82
Thayer Street The Univ. of Mich. Ann Arbor, Mich.	1959	443	7½	165,241	$ 783,392.00	373.00	$1,768.38	$4.74
Thompson Street The Univ. of Mich. Ann Arbor, Mich.	1960	758	7½	234,771	$ 917,955.00	309.72	$1,211.02	$3.91
Addn. to Church St. The Univ. of Mich. Ann Arbor, Mich.	1962	148	5	54,430	$ 246,543.00	367.77	$1,665.83	$4.53
Palmer Street Wayne State Univ. Detroit, Mich.	1965	1905	6	656,829	$2,999,000.00	344.79	$1,574.28	$4.57
Lot No. 5 The City of Birmingham, Mich.	1966	564	5	193,491	$ 927,000.00	341.86	$1,643.62	$4.79
	TOTAL	4698	40.5	1,610,219	$6,993,117.00	--	--	--
	Avg.	671.14	5.79	230,031.3	$ 999,016.71	347.18	$1,487.05	$4.27



Extend barriers into Student Portion (2 lanes) 60 stalls

316		212	
- 60		+ 60	
256	New Student Capacity	272	New Faculty/Staff Capacity

COMPARISON OF PERCENTAGES OF UNUSED CAPACITIES

PER WEEK FOR ALL LOTS

South Campus, MCCC

January 9-13, 1967	Lot #1 Staff	Lot #1 Student	Lot #2 Student	Lot #3 Student	Lot #4 Student	Lot #5 Student
7:30-11:30 AM	27 to 40%	12 to 22%	40 to 63%	69 to 89%	69 to 84%	70 to 76%
11:30-4:30 PM	15 to 27%	11 to 24%	41 to 63%	78 to 89%	69 to 84%	73 to 83%
4:30-10:30 PM	37 to 93%	32 to 84%	69 to 98%	95 to 100%	83 to 98%	83 to 99%

March 6-10, 1967						
7:30-11:30 AM	30 to 35%	7 to 11%	22 to 45%	75 to 82%	59 to 67%	59 to 69%
11:30-4:30 PM	15 to 28%	10 to 24%	47 to 60%	80 to 86%	64 to 74%	65 to 75%
4:30-10:30 PM	41 to 54%	31 to 86%	73 to 97%	82 to 100%	80 to 97%	84 to 98%

AVERAGE PERCENTAGE OF STALLS USED PER DAY

BY TIME PERIODS FOR ALL LOTS

South Campus, MCCC

January 9-13, 1967	Lot #1 Staff	Lot #1 Student	Lot #2 Student	Lot #3 Student	Lot #4 Student	Lot #5 Student
7:30-11:30 AM	65.3	84.6	50.6	22.0	27.0	25.4
11:30-4:30 PM	79.0	82.3	49.2	16.8	26.9	21.0
4:30-10:30 PM	25.7	57.3	25.2	3.0	13.0	11.4
Average	56.7	75.0	41.7	14.0	22.3	19.3
March 6-10, 1967						
7:30-11:30 AM	68.4	90.7	63.3	22.6	37.9	35.5
11:30-4:30 PM	79.6	85.4	50.2	17.7	32.0	29.8
4:30-10:30 PM	55.6	56.3	20.3	12.7	14.8	11.9
Average	67.8	77.5	44.6	17.7	28.2	25.7
March 6-10, 1967 Increase in Occupancy	11.1	2.5	2.9	3.7	5.9	6.4